TOLEDO PUBLIC LIBRARY
Technology Department

VOL. 37, NO. 9 NOVEMBER, 1948

Industrial Arts and Vocational Education

THE SHOP TEACHERS' PROFESSIONAL MAGAZINE

THE BRUCE PUBLISHING COMPANY | CENTRAL OFFICE: 20 N. WACKER DRIVE, CHICAGO 6, ILL.
540 NO. MILWAUKEE ST., MILWAUKEE 1, WIS. | EASTERN OFFICE: 330 WEST 42ND ST., NEW YORK 18, N.Y.

TABLE OF CONTENTS

Vocational Guidance in the Industrial-Arts Curriculum..*Claude E. Nihart* 343
The Case for Vertical Lettering.....*Frank Roy Kepler* 346
Industrial-Arts Co-operative Teacher Training.....*F. Lowell Jackson* 348
Matching Men and Jobs — Reorganizing the Industrial-Arts Curriculum .....*Ralph O. Johnston* 350
Needed and Wanted — More Knowledge About Electricity and Its Uses .....*R. W. Adams* and *H. H. London* 352
Some Leaders in Industrial Education.....*William T. Bawden* 355
Cyanide Hardening.....*Lester F. Spencer* 357
Editorials 358
English for Trade and Vocational Schools.....*J. Allen Morris* 362
Methods of Teaching Occupational Subjects.....*C. A. Felker* 363
Teaching Materials for Industrial Education.....*Chris H. Groneman* 365

Problems and Projects

Hack-Saw Frame.....*Paul L. Jennings* 366
The Glue Corner.....*H. A. Allender* 367
Aluminum Salt and Pepper Shakers.....*Thurston M. Rothrock* 368
Indian Silversmithing.....*Ben Hunt* 370
Let's Bind Our Magazines.....*Charles R. Kinison* 370
A Crystal Radio Receiver.....*Albert Kosloff* 373
Printing a Monthly Calendar of Events.....*Israel Bensman* 375
Display Board.....*John B. Fuller* 375
Handy Audio-Visual Projection Equipment Truck....*Miles H. Anderson* 376
Metal Desk Tray.....*Homer C. Rose* 377
Electrical Installation and Practice — An Instruction Sheet .....*Elmer C. O'Donnell* 378
Educational Toy Clock — Hickory Dickory Dock....*Harrison Neustadt* 378
Elementary Auto Mechanics.....*Frank B. Miller* 379
Aeronautics.....*William E. Nagel* 381
Simple Wall Shelf.....*Harry S. Baldwin* 382

Personal News..... 14A
Association News..... 16A
Questions and Answers..... 20A
News Notes..... 21A
New Publications..... 22A
Shop Equipment News..... 26A

Entered January 2, 1914, as Second-Class Mail Matter at Milwaukee, Wis., under Act of March 3, 1879. Copyright, 1948, by the Bruce Publishing Co. Title registered as Trade Mark in U. S. Patent Office, November 25, 1930. Published monthly except during July and August.

Subscription Information. — Subscription price in the United States, Canada, and countries of the Pan-American Union, $3.00 per year, payable in advance. Postage, foreign countries, 50 cents. Copies not over three months old, 35 cents; more than three months, 50 cents.

Discontinuance. — Notice of discontinuance of subscription must reach the Publication Office in Milwaukee, at least fifteen days before date of expiration. Notices of changes of address should invariably include the old as well as the new address. Complaints of nonreceipt of subscribers' copies cannot be honored unless made within fifteen days after date of issue.

Editorial Contributions. — The Editor invites contributions bearing upon Industrial Arts, Vocational Education, and related subjects. Manuscripts, drawings, projects, news, etc., should be sent to the Publication Office in Milwaukee. Contributions are paid for at regular space rates. In all cases manuscripts should be accompanied by full return postage.

Articles Indexed. — The articles contained in the Magazine are regularly indexed in "The Readers' Guide to Periodical Literature," and "Education Index."

Teacher's Organizations

The list of conventions shown below, gives the reader an excellent chance to get a survey of a number of interesting meetings that will be held during the months of October, November, and December. Probably most of our readers are interested in more than one of those scheduled. Be that as it may, not every teacher is in the position to attend all of the conventions that he would like. That means that a wise choice will have to be made. Only the individual concerned can decide whether a local, state, or national meeting will have most value for him. The big thing, however, is that those who attend any of the meetings should contribute as well as be there in person. A profession can grow only when its members work together to make it grow. Join teachers' organizations, and help your professional group grow.

This Month's Cover

The picture chosen for the November cover of INDUSTRIAL ARTS AND VOCATIONAL EDUCATION shows a corner of the machine shop at the Western Michigan College of Education, Kalamazoo, Mich. Photograph, courtesy of the South Bend Lathe Works, South Bend 22, Ind.

Coming Conventions

Oct. 22–23. Four State Regional Industrial Education Conference at Pittsburg, Kans. Headquarters, Kansas State Teachers College, Pittsburg, Kans. General chairman, Dr. J. V. Melton, Pittsburg, Kans.

Oct. 26–29. Virginia Vocational Association at Richmond, Va. Secretary, Robert F. Williams, 401 N. 9th St., Richmond 19, Va.

Nov. 3–6. Missouri Vocational Association at Kansas City, Mo. Headquarters, Municipal Auditorium. Chairman, Sam Hall, High School, Clayton, Mo.

Nov. 4. Iowa Vocational Association at Des Moines, Iowa. Headquarters, Hotel Savery. Chairman, Wayne Prichard, Sac City, Iowa.

Nov. 4–6. Wisconsin Industrial Arts Association at Milwaukee, Wis. Headquarters, Milwaukee Auditorium. Chairman, William A. Sherman, 1817 Emery St., Eau Claire, Wis.

Nov. 5–6. New England Industrial Arts Association, Concord, N. H. Secretary, Arthur I. Martin, State Teachers College, Gorham, Me.

Nov. 11–13. Industrial Arts Conference at Chicago, Ill. Headquarters, Hotel LaSalle. Chairman, Verne C. Fryklund, The Stout Institute, Menomonie, Wis.

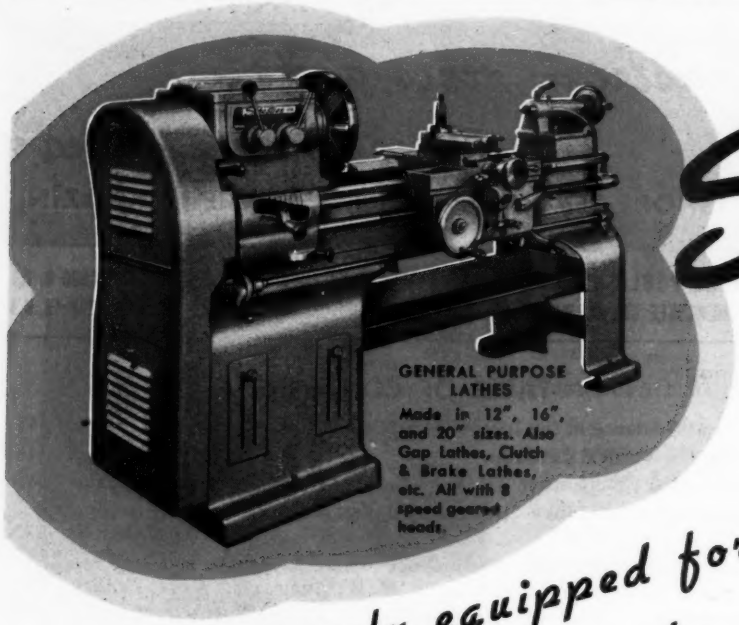
Nov. 28–29. National Association of Industrial Teacher Trainers at Milwaukee, Wis. Headquarters, Hotel Schroeder. Chairman, Dr. Harold Silvius, Wayne University, Detroit, Mich.

Nov. 28–Dec. 3. National Council of Local Administrators of Vocational Education and Practical Arts at Milwaukee, Wis. Headquarters, Hotel Schroeder. Secretary, Frank Huffaker, 215 Chestnut St., Chattanooga 3, Tenn.

Nov. 29–30. National Association of State Directors of Vocational Education at Milwaukee, Wis. Headquarters, Hotel Schroeder. President, Ernest J. Simon, 216 E. Monroe St., Springfield, Ill.

Nov. 29–Dec. 4. American Vocational Association at Milwaukee, Wis. Headquarters, Milwaukee Auditorium. Executive Secretary, L. H. Dennis, 1010 Vermont Ave., Washington 5, D. C. Local chairman, William J. Rasche, Milwaukee Vocational and Adult Education School, Milwaukee 3, Wis.

Nov. 30–Dec. 1. American Association of Technical High Schools at Milwaukee, Wis. Headquarters, Hotel Schroeder. Chairman, William N. Fenninger, 23 South Pearl St., Albany, N. Y.



Sebastian GEARED HEAD LATHES

✓ *Completely equipped for thorough training*

✓ *Value leader in the medium-price field*

Manufactured By KING — BUILDERS OF WORLD-RENOWNED "KING" BORING & TURNING MACHINES

BIG LATHE FEATURES MAKE THE SEBASTIAN "FIRST IN TEACH-ABILITY"

Following are some of the outstanding superior features of Sebastian Lathes:

TIMKEN TAPERED ROLLER BEARINGS on all shafts in headstock.

OVERSIZED, HEAT-TREATED STEEL GEARS in headstock.

APRON CONTROL for start, stop, and reverse of lathe spindle. (Standard on lathes with 10', 12', and 14' beds.)

REVERSE IN APRON for feeds.

ACCURACY .0005" at every point of alignment.

57 FEED AND THREAD CHANGES.

TAPER GIBS throughout.

AUTOMATIC SPLASH LUBRICATION for all gears in headstock.

LARGE HOLE through spindle.

ALL OF THESE ITEMS ARE SUPPLIED AS STANDARD EQUIPMENT, INCLUDED IN BASIC LATHE PRICE:

MOTOR & WIRING • REVERSING SWITCH • TOOL POST
COOLANT PANS • SPINDLE SLEEVE • CABINET LEG
THREADING DEPTH STOP • LEVELING SCREWS & PLATES
FACE PLATE • DOG PLATE • CENTERS • WRENCHES

In addition to above items, Apron Control and Center Leg are also included as standard equipment on lathes with 10', 12', and 14' beds.

Students trained on a Sebastian Lathe are right at home when they start work in a machine shop. Often they're called upon to operate another Sebastian, widely used throughout industry. And even on big, expensive engine lathes, they find no construction or operating feature essentially different from what they're familiar with in a Sebastian.

Typical is the time-saving Sebastian 2-Station Control—one control at the apron, the other at headstock. The Apron Reverse has operating handle right on the apron. Other outstanding Sebastian features and items furnished as standard equipment are listed at the left.

Built to traditional King standards of quality and precision, the modern Sebastian offers definitely "more lathe for your money." Write today for new Catalog S-1, featuring Standard Type "R" Sebastian Lathes. Make your own comparisons . . . we're confident you'll find the Sebastian best qualified for student training.

American Steel Foundries

KING MACHINE TOOL DIVISION

CINCINNATI 29, OHIO

Builders of King Vertical Boring & Turning Machines and Sebastian Lathes

-IAVE-
NOVEMBER . . 1948

Vocational Guidance in the Industrial-Arts Curriculum

CLAUDE E. NIHART
Head Supervisor
Vocational and Practical Arts
Los Angeles City Schools
Los Angeles, Calif.

Occupational exploration is the contribution of industrial arts to the vocational guidance program. Occupational exploration has always been one of the major aims of industrial arts in the secondary schools. The actual progress toward the attainment of this aim is difficult to measure.

There are a number of ways to explore trade and industrial occupations. Among those most commonly used are:

1. Student participation in a wide variety of tool and machine operations typical of trade and industrial occupations represented in the school shops.
2. Student investigation and study.
3. Field trips to industrial plants and buildings under construction.
4. Talks by speakers from trade and industrial fields.
5. Motion pictures of industrial production.
6. Teacher presentation of reliable occupational information followed by class discussion and individual conferences.

In the Los Angeles secondary schools a fair degree of success has been achieved by the first five methods. The sixth method, however, has not been so successful due to the lack of a scientific approach to the problem of vocational guidance and because until recently industrial-arts teachers have had no source of up-to-date occupational information.

Since the problem of guidance is one that concerns all teachers, the Los Angeles industrial-arts curriculum committees, after considerable discussion, recommended that sections on vocational guidance be included in all industrial-arts course publications. This recommendation was accepted and, with the assistance of the vocational-guidance supervisor of the Curriculum Division, vocational-guidance sections were added to all industrial-arts courses.

The following outline pertaining to the general metal area in senior high schools is typical of the guidance material which has been developed for other industrial-arts areas.

Vocational Guidance

The teacher of general metal in the senior high school has a slightly different vocational guidance objective from that of his counterpart in junior high school. In the junior high school the purpose of exploration is to enable the pupil to gain an overview of the six major fields of vocational interest (aesthetic, commercial, mechanical, natural, scientific, and social) and to discover his own interests and preferences. In the senior high school, the assumption is made that the major interest of the industrial-arts student is in the mechanical field.

General metal in the senior high school is not just an overview of the six broad vocational interest fields. Rather, it is exploration of the areas that comprise the mechanical field (construction, design, operation, production, and repair). It is a closer examination of the metalworking opportunities and requirements within these areas. It especially is an exploration of the student's own abilities.

Occupational Information

Occupational information has a very definite place in the teacher's instructional program of each term. The pupil's choice of a high school major and his future career will be greatly influenced by his industrial-arts experiences and by his knowledge of the general requirements and occupational opportunities in the mechanical field. The instructor will give much occupational information incidentally to other instruction, but he should also set aside one or more periods before the close of the semester to review and pull together the metalworking experiences of the class and to relate these to the occupational opportunities and requirements of the metal trades and related occupations. (Vocational films for this purpose are available through the audio-visual aids section, and suggestions for the giving of occupational information may be obtained from the vocational-guidance personnel in the curriculum division.)

The instructor of general metal cannot consider that his students have *explored* his course until they know and can identify:

1. The relationship of the course to the mechanical interest field and subordinate areas.
2. The major areas or segments of the metal trades.
3. The major products and services of the metal trades.
4. The common processes performed and degrees of skill needed in the various metalworking occupations.
5. The special equipment and machinery used in metalworking.
6. The worker qualifications and requirements exclusive to the metal trades.
7. The satisfactions and rewards which make metalwork interesting.

Students in eleventh- and twelfth-grade courses, in addition to the preceding, also will need to know:

1. The common working conditions to be found within each segment or branch of the metal trades.
2. The lines of advancement and salary remuneration.
3. The employee and employer organizations affecting the metal trades and the general policies affecting members.
4. The general employment trends and opportunities in the metal trades.

5. The further training and educational opportunities leading to specialized occupations in the metal trades.

A major responsibility of the general metal teacher, in addition to providing up-to-date, valid occupational information, is to determine the degree of interest and aptitude for metalwork possessed by each student. He can do this by direct observation or by testing. Though there are a number of good interest inventories and aptitude tests, none of these equals the observations which an instructor makes of the student's preferences and performance in the shop. Therefore, the metal instructor, throughout the term, should be weighing the capabilities of the student and possible outlets for such skills as the learner may possess. The opinion of the general metal teacher will be valued by the student and welcomed by the parents and school counselor. Any marked aptitudes or inaptitudes, together with recommendations, should be reported each semester for incorporation into the student's cumulative record.

Classification of Occupations

In order to make possible a comparison and evaluation of interests and abilities as revealed, not only in general metal but by other industrial-arts courses, it is necessary that each instructor follow the same basic classification of occupations. The Los Angeles City Schools, after making a study of the 10,000 most common occupations in the city, have more or less arbitrarily classified all jobs into one of the following six fields:

Aesthetic Field: Occupations requiring an interest in creating things of beauty, working out ideas in accordance with the principles of art.

Commercial Field: Occupations requiring an interest in business activities and the providing of goods or services at a profit.

Mechanical Field: Occupations requiring an interest in making things with the aid of tools or machines or using the laws of mechanics to develop power and save labor.

Natural Field: Occupations requiring an interest in developing or producing products of the earth or those found in fields, streams, forests, and rivers.

Scientific Field: Occupations requiring an interest in using exact thinking and scientific laws to discover, make, or utilize new materials, products, or processes.

Social Field: Occupations requiring an interest in activities seeking to remedy or eliminate human discomfort, working for the betterment of society, serving the personal needs of people, or providing leisure-time enjoyment.

Metal trade occupations, for the most part, fall into the mechanical field. A few may be classified in the craft-arts area of the aesthetic field. Each field is further subdivided into areas. The areas in the mechanical field in which electrical occupations are to be found are:

1. *Design Area:* Occupations calling for planning and developing mechanical equipment and engineering projects. Examples: Industrial engineer, industrial designer, draftsman, mining engineer, safety engineer, mechanical engineer.

2. *Construction Area:* Occupations calling for erecting structures and heavy mechanical equipment. Examples: Boilermaker, cable splicer, lead burner, plumber, steam fitter, wire fence erector, roof tinsmith, structural steelworker, wire spinner, reinforcing ironworker.

3. *Operation Area:* Occupations that involve controlling and operating mechanical devices. Examples: Filer, buffer, bodymaker, grinder, lathe operator, melting machine operator, coremaker.

4. *Production Area:* Occupations that call for producing or making goods with the aid of tools or machines. Examples: Blacksmith, foundryman, machinist, toolmaker, diesinker, patternmaker, sheet-metal man, molder, welder.

5. *Repair Area:* Occupations that call for keeping up or mending mechanical equipment. Examples: Boiler repairman, locksmith, pump serviceman, utility repairman, tool dresser, household appliance repairman, elevator repairman, oil burner repairman.

In the craft-arts area of the aesthetic field are several metalworking occupations:

6. *Craft-Arts Area:* Jeweler, silversmith, watchmaker, jewelry manufacturer, engraver.

In the laboratory area of the scientific field are also several metal trades:

7. *Laboratory Area:* Electroplater, heat-treater, case hardener, temperer, furnace tender, harness inspector.

A well-planned exploratory program would provide tryout opportunities in each of the foregoing areas. The exploratory experiences should further be representative of all levels of ability and difficulty, ranging from the unskilled and manual, through the highly skilled to the technical and professional.

The instructor of twelfth-grade students majoring in industrial arts stands in a key position, particularly in those schools which do not have complete vocational advisement services for seniors. In such schools the industrial-arts instructor must assume the responsibilities of a vocational adviser and take the time to counsel personally each graduating senior about his industrial-arts experiences, his capabilities, interests, and opportunities. He should assist such students in making out a post-high school vocational plan for further training or job placement and advise them about the various placement services and the techniques of job finding and job keeping.

Posthigh School Training Opportunities

The two major agencies in Los Angeles for preparing youth for trade and industrial occupations are the Frank Wiggins Trade School and the Apprenticeship program, both under the management of the Los Angeles city schools. At the managerial, semiprofessional, and professional levels are the semiprofessional and degree courses at the junior college, university, and technical schools. Instructors will want to keep available the latest catalogs and descriptive folders regarding the training opportunities and entrance requirements of these training agencies.

The Frank Wiggins Trade School offers instruction in aircraft mechanics, aircraft sheet metal and mechanics, aircraft welding, machine shop, sheet metal, steel fitting and layout, welding (gas and electricity), building sanitation for plumbers, lead burning, pattern drafting, plumbing, refrigeration, and air conditioning. Courses are either pre-employment or trade preparatory and are usually co-ordinated with a work-experience or apprenticeship program.

The apprenticeship and training standards for the metal trades vary from 2000 to 8000 clock hours, depending upon the specific trade to be learned and call for a minimum of 144 hours class instruction per year. High school graduation and 18 years of age are usually required for admittance to an apprenticeship.

Occupational Briefs

On the following pages are abstracts of occupational information for several of the more common occupations. The dominant interest area (construction, design, laboratory, operation, production, repair) and the code number according to the *Dictionary of Occupational Titles and Codes* are given for each job. These references will enable the vocational adviser to locate additional information from board of education publications.

Interest Field: Mechanical
D.O.T. Codes: 4-81
Interest Area: Production
4-82

Foundryman

Nature of Work — The all-round foundryman knows the work in every department of the foundry. The work, however, has become so specialized that a foundryman may be an expert in one phase of foundry work, as cu-

pola tending, coremaking, sand controlling, and molding.

Foundry work is the primary branch of the metal trades which involves the making of metal castings. Patterns of wood or sheet metal are cut for the parts to be made, and sand molds are made from the patterns. The sand is mixed with oil or other agent to hold it in place. If the casting is to be hollow, a core, the shape of the inside, is made and often baked in a hot oven. The core is placed in the mold and hot metal is then poured around the core. When the metal hardens, the mold is taken off, leaving a metal piece shaped like the original pattern. This piece is called a casting. It is usually necessary to smooth the rough edges and surfaces of the casting, either by machine or by hand.

The patterns are made by a patternmaker, the molds by a molder, the cores by a coremaker, the small molds by a bench molder, the large molds by a floor molder; the furnace is tended by a cupola or furnace man and the castings are cleaned up by chippers and snaggers.

Qualifications and Training:

Education, Basic: High school.

Education, Technical: Blueprint reading, mechanical drafting, forge and foundry, patternmaking, machine-shop practice, characteristics of metals, use of precision instruments, weighing and mixing alloys, judging temperatures of molten metals, use of pyrometers.

Manipulative Skill: Shoulder-arm-hand dexterity; use of both hands; tactile sense in fingers.

Physical Requirements: Continuous standing while working at bench; lifting moderate to heavy objects.

Conditions of Work — Inside, hot, wet, dusty, dirty, odors, noisy, vibrations; exposure to burns, radiant energy, and toxic conditions.

Lines of Promotion — Helper, apprentice, trainee, journeyman, patternmaker, foreman, general superintendent.

Where Employed — Blast furnaces, steel works, gray-iron castings, malleable-iron castings, munitions works, steel castings, nonferrous metal foundries, iron and steel products, locomotives and parts, aircraft manufacture and parts, automobile manufacture and parts, engines and turbines, metalworking machinery, machine tools, pumps and compressors, ship and boat building and repair.

Time to Learn and Training Opportunities — A four-year apprenticeship is necessary to become an all-round foundryman; specialized branches take from six months to four years to learn. Patternmaking requires four to five years' apprenticeship.

Interest Field: Scientific
D.O.T. Code: 4–87.010
Interest Area: Laboratory

Heat Treater

Nature of Work — Alters the physical properties of metals, such as aluminum, duraluminum, and steel alloys to desired specifications by heating to a predetermined temperature in a furnace or pre-heated chemical bath (such as potassium or sodium nitrate) and quenching the metal in a suitable bath of oil or water; repeats the heating and quenching operations if necessary or permits the metal to cool naturally to attain the desired results. There are five principal processes in the heat-treating of metals: annealing, normalizing, hardening, tempering, and casehardening.

Qualifications and Training:

Education, Basic: High school, including chemistry and physics.

Education, Technical: Composition of carbon and alloy steel; critical temperatures and heating characteristics, physical and chemical changes caused by heating; construction and operation of heat-treating furnaces; use of pyrometers; methods and agents in cooling metals; methods of hardness testing.

Manipulative Skill: Shoulder-arm-hand dexterity; deftness in handling and grasping with tongs and manipulating valves.

Physical Requirements: Standing, lifting moderate to heavy objects.

Conditions of Work — Inside, intense heat near furnace, smoke, poisonous fumes, roar, splashing of quenching liquids, handling poisonous materials, danger of burns.

Lines of Promotion — Apprentice, helper, trainee, journeyman, leader, foreman.

Where Employed — Aircraft manufacture and parts, automobiles and equipment, small arms ammunition, iron and steel manufacture and processing, firearms, railroad equipment, ship building and repairing, motorcycles–bicycles and parts, electrical machinery, light and heavy machinery, and machine tools.

Time to Learn and Training Opportunities — A number of companies maintain apprenticeships in heat-treating which require four to six years to qualify for journeyman ratings. However, many concerns do not require all-round craftsmen and train workers in shorter periods of time to perform specialized phases of heat-treating.

Interest Field: Mechanical
D.O.T. Code: 4–75.010
Interest Area: Production

Machinist

Nature of Work — Makes and repairs all kinds of metal parts, tools, and machines; uses hand tools, such as scrapers, chisels, files, and measuring instruments; operates all machine tools, such as lathes, milling machines, shapers, and planers. The machinist works with iron, steel, and other metals. He cuts out parts from metal sheets, blocks, rods, and cylinders; makes steel dies with which to stamp out other parts; finishes and trims to size parts cast from molten metal in the foundry; drills holes in various forged, cast, and machined parts; makes bolts and rivets for putting them together; assembles the parts and tests the operation of the finished machine. The machinist also repairs broken parts or makes new parts. If a bearing becomes worn, he puts in a new one. If a machine breaks down, he finds out what is wrong and fixes it. He also makes tools, if necessary, to do special jobs.

Qualifications and Training:

Education, Basic: High school.

Education, Technical: Blueprint reading, working knowledge of mechanical drawing and shop mathematics; use of measuring instruments and simple calculations; details of machine operation, use, and adjustment; action of cutting tools; common metals and cutting speeds; some knowledge of forge, foundry, and welding.

Manipulative Skill: Hand and shoulder dexterity; finger dexterity for certain jobs.

Physical Requirements: Strength, continuous standing, sureness, keen vision, steady nerves, and delicate touch and hearing for certain jobs.

Other Essentials: Carefulness, orderliness, accuracy, speed, judgment, resourcefulness, confidence.

Conditions of Work — Standing, little sitting, moderate to heavy lifting; inside generally, unless an "outside machinist" in which climbing, stooping, and crawling also is involved; dusty, oily, and greasy; continuous pace; danger to eyes of flying chips and exposure of hands to moving objects; not seasonal, but trade can be hard-hit by depression.

Lines of Promotion — Apprentice and helper, journeyman, inspector, foreman, estimator, shop proprietor.

Where Employed — Aircraft manufacture and parts, ship and boatbuilding and repair, munitions works, armament manufacturing, automobile manufacture and repair, instrument repair, diesel engines, agricultural machinery, railroad equipment, wood and metalworking machinery, foundry, machine shop, electrical machinery, petroleum refining.

Time to Learn and Training Opportunities — A minimum of forty weeks of trade school preparatory training is required to qualify one to enter the trade as an advanced apprentice. Workers may qualify in the trade entirely by job training, but will experience difficulty in securing training opportunity. The authorized apprenticeship is four years of 8000 clock hours.

Interest Field: Mechanical
D.O.T. Code: 5–30.210
Interest Area: Construction

Plumber

Nature of Work — The plumber is a craftsman who installs pipes for gas, water, waste, and vent lines, and repairs them; he also installs bathtubs, lavatories, and other plumbing fixtures for houses or buildings. The installation of these involves work of a technical nature that must comply with strict building ordinances governing sanitation. The plumber does his roughing-in and all pipework when the building is under construction, and he installs fixtures when the job has been completed. The information for making installations and pipe layouts is secured from blueprints.

Qualifications and Training

Education, Basic: High school.

Education, Technical: Mathematics: lineal, area and volume measurements, fractions, and scale reading. Drawing: isometric, basic principles of construction, work sketches, and blueprint reading.

Manipulative Skill: Manual dexterity in the use of hand tools.

Physical Requirements: Robust health, medium build, active, no physical handicap.

Other Essentials: Mechanical aptitude, interest in mechanical manipulations.

Special Requirements: None.

Conditions of Work — Inside and outside. Must travel to job. Not seasonal.

Lines of Promotion — Helper, journeyman, foreman, estimator, master plumber.

Where Employed — Building construction, general contracting, general building maintenance, plumbing, heating, and air conditioning.

Time to Learn and Training Opportunities — A minimum of 40 weeks of trade school preparatory training is required to qualify one to enter the trade as a helper. Workers may qualify in trade entirely by job training, but will experience difficulty in securing training opportunity.

Interest Area: Construction
D.O.T. Code: 4–80.010

Sheet-Metal Worker

Nature of Work — The sheet-metal worker deals with all kinds of sheet metal and uses both hand and machine tools. The technical side of the sheet-metal trade is based on the ability to do developmental drawing. Practically all of the work requires that a pattern be developed on the flat piece of stock before it can be folded and bent to desired shape. A sheet-metal worker plays an important part in building construction. He is called upon to lay out patterns for and fabricate many articles and parts used in building construction, ranging from simple gutters to complicated architectural sheet-metal work. Air conditioning, heating, and ventilating, hotel, restaurant, and fountain equipment, electric signs, and marquises furnish problems that call for skill of a highly technical nature. He must read blueprints and calculate the quantity of materials used and be able to figure the time required to complete a job.

Qualifications and Training

Education, Basic: High school.

Education, Technical: Mathematics: addition, subtraction, multiplication, division, fractions, square root, linear measure, areas, and volume. Drawing: geometric, perspective, sketching, sheet-metal pattern drafting, blueprint reading. Science: sheet-metal workers' metallurgy.

Manipulative Skill: Manual dexterity in the use of hand tools and sheet-metal bench machines.

Physical Requirements: Strong, active, no physical handicaps, possess endurance.

Other Essentials: Mechanically inclined, ability to work under supervision, take orders from others and carry them out to the letter; ability to use machines and tools; self-reliance, initiative.

Special Requirements: None

Conditions of Work — Working conditions healthful; inside and outside work; climbing of ladders and working on scaffold; work not confining, and not seasonal.

Lines of Promotion — Apprentice, journeyman, job foreman, shop foreman, pattern cutter, estimator, contractor.

Where Employed — Jobbing shops, general sheet-metal shops, airplane factories, ship yards, auto body and fender shops, railroad shops, heating and ventilating shops; hotel, restaurant, and fountain equipment factories.

Time to Learn and Training Opportunities — A minimum of forty weeks of trade school preparatory training is required to qualify one to enter the trade as an advanced apprentice. Workers may qualify in the trade entirely by job training, but will experience difficulty in securing training opportunity.

The Case For Vertical Lettering

FRANK ROY KEPLER

Formerly Supervisor, Department of Vocational Education, Detroit Public Schools, in Charge of Drafting; and Former Associate Professor of Industrial Arts

Wayne University
Detroit, Mich.

The question of vertical vs. inclined lettering is quite controversial among draftsmen and drafting teachers. The author's purpose in making this study was to determine the extent to which the two types of lettering are used in industry and treated in engineering and school texts on drawing and lettering. It is hoped that a lively, objective interest will be aroused in the question and that comments will be forthcoming.

Single line gothic, engineering type lettering is universally used on working drawings because of the ease and speed with which legible characters can be formed. Opinion and practice seems to be divided between vertical and inclined.

In 1929, a subcommittee on lettering of the sectional committee on the standardization of drawings and drafting room practice was sponsored by the American Socity of Mechanical Engineers and the American Society for Engineering Education. The following paragraphs are from the preliminary proposal of subcommittee No. 3.

At one time, it was the general opinion that lettering should be sloped as in script, thereby combining uniformity and speed. A number of letter forms have been promulgated but, in apparent contradiction to theory, the vertical letter has been adopted by many of the larger manufacturers as being the type of lettering that tracers can make legibly and uniformly. As in script, sloped letters invariably carry personal characteristics of the individual; this feature is not so noticeable where vertical letters are used. It is also noticeable that vertical lettering produces work which is more legible in the blueprints.

In a questionnaire recently sent to the industries and educational institutions it developed that the industries are in the favor of the vertical lettering and the educational institutions the inclined letters.

In making recommendations for a universal type of lettering, it seems desirable to be governed by the group which uses it in practice.

A. Vertical capitals, vertical caps and small caps, and vertical lower case letters are recommended with a slight preference for vertical capitals and vertical caps and small caps in all titles, subtitles, notes, and parts lists.

"Based on this view," as expressed in the proposal "the committee proposed the adoption of vertical lettering as the standard, but this recommendation met with so much opposition that it became necessary to recommend both vertical and inclined capitals and inclined lower case."[1]

The accompanying chart is included to show the trend as evidenced by results of a survey made by the speaker in 1932 and one made by N. Ralph Tucker in 1942.

TABLE I

		No.	*Per cent*
Vertical required	1932	22	19
	1942	8	11
Inclined required	1932	48	41
	1942	13	19
Either accepted	1932	47	40
	1942	51	71

In the survey taken in the year 1932 the percentages were as follows: Vertical required, 19 per cent; inclined, 41 per cent; either, 40 per cent. In Tucker's survey the percentages are vertical required, 11 per

[1] P. 109, Giesecke, Mitchell, and Spencer, *Technical Drawing* (New York: Macmillan Co.).

cent; inclined, 19 per cent; and either, 71 per cent (rounded numbers). The difference as shown by these two surveys are 42 per cent downward trend in the vertical required, in the inclined a 54 per cent decrease, and in the ones that accept either a 77 per cent increase. There were such a few cases indicating a preference where either was acceptable that it is impossible to draw any conclusion on that point.

Tucker's survey indicates that in 1942 industry requires or accepts inclined lettering, although in 71 per cent of the cases either vertical or inclined is acceptable for various reasons.

We fully realize that the war effort greatly controlled the lettering done at the time of Tucker's survey in 1942, since practically all industries were concentrating on the manufacture of war goods and materials, some of which were very foreign to their peacetime products, as was mentioned in several of the letters accompanying the return questionnaires, "during the present emergency we accept any style of lettering as long as it is neat and legible, although we prefer . . ."

Data obtained from a study of the responses to Tucker's Lettering Survey shows the number and nature of responses and the number of draftsmen employed.

TABLE II

No. of replies	*Nature of responses*	*Draftsmen employed*
73*	Responses were considered	
7	Companies require vertical only	729
16	Companies *require inclined* only	*1305*
8	Companies accept either vertical or inclined, but *prefer vertical*	*1196*
6	Companies accept either vertical or inclined, but prefer inclined	320
35	Companies accept either with no preference	1198–1283
1	Company uses both vertical and inclined	30
15	Companies *require* or *prefer vertical*	*1925*
22	Companies require or prefer inclined	1625

*Eleven companies, because of government restrictions, did not state the number of draftsmen employed, among them some employing a large number of draftsmen.

The A.S.A. Standard-Drawings and Drafting Room Practice (1946) contains the following recommendations:

"That single stroke commercial gothic lettering either vertical or inclined at a slope of 2 to 5 be used on all working drawings for titles, notes, etc."[2]

Six types or heights are shown — Type 1, ¼ in. high to be used for main titles and drawing numbers; Type 2, 3/16 in. high for subtitles or main titles on small drawings; Type 3, ⅛ in. high for headings and prominent notes; Type 4, 3/32 in. high for bills of material, dimensions, and general notes; Type 5, same as type 4 but using type 3 for first letter of principal words (may be used for subtitles and notes in the body of drawings); Type 6, lower case. Vertical letters are shown first on page 52 followed on page 53 by a similar chart of inclined letters.

The final recommendations of the A.S.A. Standard-Drawings and Drafting Room Practice are quoted or reproduced in entirety in the leading texts on engineering drawing.

A comment may not be out of place.

[2]P. 52, Drawings and Drafting Room Practice, American Standard, Bulletin Z14.1–1946, New York: 70 East 45th St., American Standards Association.

TABLE III

Treatment Given Vertical and Inclined Lettering in Engineering Drawing and Secondary School Texts on Drafting

	Order of presentation		*Pages devoted to*	
Engineering texts	*Vertical*	*Inclined*	*Vertical*	*Inclined*
Carter and Thompson — 1943	2nd	1st	1	2
French — 1941	1st	2nd	4	2
Giesecke, Mitchell & Spencer — 1940	1st	2nd	5	2
Hobart — 1940	2nd	1st	¾	2
Rheinhardt — 1895	2nd	1st	7	7
Svensen — 1935	1st	2nd	4	1
School texts				
Berg — 1942	1st	2nd	1½	1
French and Svensen — 1940	1st	2nd	1½	2
Fryklund and Kepler — 1938	1st	2nd	7	
Green — 1945		1st		2
Hoelscher and Mays — 1941		1st		3
Johnson and Newkirk — 1944	1st	2nd	5½	5½
Klenke — 1940	2nd	1st	3	6
Mattingly and Scrogin — 1940	1st	2nd	2	3
Pawelek — 1947	1st		5	
	9 first	6 first	47¼	38½

In nine texts vertical lettering is treated first; in six texts inclined lettering is treated first, in two texts vertical lettering is not presented; in one text inclined lettering is not presented.

Forty-seven and a quarter pages are devoted to the presentation of vertical lettering; thirty-eight and a half to inclined lettering.

According to a survey made by the speaker in 1932, 93 per cent of the responses indicated that only capitals were recommended for working drawings, 64 per cent recommended all capitals of uniform height. About half of the responses indicated letters ⅛ in. high for notes, 35 per cent 3/32 in. high. Only 6 per cent indicated the use of capitals and lower case. The height of lettering and dimension figures should be such as to make notes and dimensions easily legible under all conditions.

Table III is rather revealing in that vertical lettering is given precedence in 50 per cent more drafting texts and lettering books than inclined lettering; nearly 30 per cent more pages.

For many years it has been claimed that inclined lettering is easier to teach. Some experienced teachers however claim that they find it easier to teach vertical lettering first. The basic form, proportion, direction, and order of the strokes with few exceptions are the same.

D. E. Hobart, *Enginering Drawing*, page 27:

"Most draftsmen will admit that vertical lettering is more difficult to do well than the slanting style, and for that reason it is not widely used on drawings. But on account of its greater readability it has been used generally throughout this text for captions, and tabulated data.

"It is true that good vertical lettering is more pleasing than inclined lettering of the same quality and that one who can letter well vertically has no difficulty with the slanting type."

Giesecke, Mitchell, and Spencer, *Technical Drawing*, page 109:

"It is the conviction of the authors that vertical lettering is more legible but more difficult to execute than inclined lettering but that engineering students should be able to use either when required."

Berg, *Mechanical Drawing*, page 34:

"The lettering most highly recommended for mechanical drawing consists of vertical capital letters."

Page 36: "Most industries now use vertical capital letters for notes and titles on their mechanical drawings. As some instructors wish to teach both vertical and inclined lettering both alphabets are included. If both vertical and inclined are to be learned, the vertical style should be taken up first."

French and Svensen, *Mechanical Drawing for High Schools*, page 15:

"In learning both styles vertical and inclined, it is better to take up vertical lettering first."

Johnson and Newkirk, *Modern Drafting*, page 12:

"A good draftsman is required to letter well, using either inclined or vertical letters. Many instructors feel that the student should learn to make vertical Gothic letters first because this kind of letter is becoming more and more popular in the industrial world."

Klenke and Hayes, *Elementary Mechanical Drawing for High Schools*, page 45:

"The student should become expert in both this style (vertical) and the single stroke inclined letter . . . as they form the basis of other single stroke letters."

Colvin, Francis W., George Trade School, Detroit, and other teachers have stated that they had made it the practice to teach vertical lettering first.

An observation that anyone may verify is that vertical lettering conforms to the design in many more situations than inclined lettering, as in labels, posters, and printed title strips, and also conforms to the tendency toward simple lines in design. It is claimed that other advantages of vertical lettering are: (*a*) adopted by many of the larger industrial concerns as being the type of lettering that tracers can make legibly and uniformly, (*b*) personal characteristics of the individual are not so noticeable where vertical letters are used, and this is often a factor when considered from drawing to drawing in a series, (*c*) vertical lettering produces work which is more legible in blueprints, (*d*) architectural lettering and most other styles are basically and principally vertical, (*e*) considered by many that it is easier to change from vertical to slant than from slant to vertical.

Considering that most students in drafting will never be architectural, machine or tool draftsmen they would find many practical uses for lettering on other than working drawings as posters, signs, charts. On this basis, the advantages cited and evidence submitted, vertical lettering should have preference over inclined especially in junior high and comprehensive high schools.

BIBLIOGRAPHY

Engineering Texts

Carter, Isaac Carter, M.S. (C.E.) C.E., Late Professor of Civil Engineering, University of Idaho and Thompson, H. Loren, M.S. Assistant Professor Northwestern Technological Institute, *Engineering Drawing Practice and Theory*, Second Edition, 1943 (Scranton, Pa.: International Textbook Co.).

French, Thomas, M.E., D.Sc., Late Professor of Engineering Drawing, Ohio State University, *A Manual of Engineering Drawing*, Sixth Edition, 1941 (New York: McGraw-Hill Co., Inc.).

Giesecke, Frederick E., Ph.D., Professor Emeritus, Formerly Professor of Drawing, Agriculture and Mechanical College of Texas; Mitchell, Alva, B.E.E., Professor Emeritus of Engineering Drawing, Formerly Head of Department, Agricultural and Mechanical College of Texas; Spencer, Henry Cecil, A.B., B.S. in Arch., Professor of Engineering Drawing, Chairman of Department, Illinois Institute of Technology, *Technical Drawing*, Second Edition, 1940 (New York: Macmillan Co.).

French, Thos. E., Late Professor of Engineering Drawing, Ohio State University, and Svensen, Carl Lars, Consulting Engineer and Author of Drafting for Engineers, *Mechanical Drawing*, Fourth Edition, 1940 (New York: McGraw Hill Book Co., Inc.).

Fryklund, Verne C., Ph.D., Formerly Associate Professor of Industrial Education, Wayne University, President of The Stout Institute (1946), and Kepler, Frank Roy, B.S., Formerly Supervisor of Drafting, Detroit Public Schools and Associate Professor of Industrial Education, Wayne University, *General Drafting*, 1938 (Bloomington, Ill.: McKnight and McKnight).

Green, Daniel, B.S., M.A., Instructor, Machine Drawing and General Drawing, The Stout Institute, Menomonie, Wis., *Drawing for Life and Industry*, 1945 (Milwaukee, Wis.: The Bruce Publishing Co.).

Hoelscher, Randolph Philip, Professor of General Engineering Drawing, University of Illinois, and Mays, Arthur Beverly, Professor of Industrial Education, University of Illinois, *Basic Units in Mechanical Drawing*, Book 1, 1933, Second Edition, 1941 (New York: John Wiley and Sons, Inc.).

Hobart, D. E., Associate Professor of Mechanism and Engineering Drawing, University of Michigan, *Engineering Drawing*, 1941 (Boston: D. C. Heath and Co.).

Svensen, Carl Lars, M.E., *Drafting for Engineers*, 1927, Second Edition, 1935 (New York: D. Van Nostrand Co.).

Lettering

Reinhardt, Charles W., Chief Draftsman, *Engineering News* (Copyright, 1895), Ninth Edition, Revised and Enlarged, 1904 (New York: D. Van Nostrand Co.).

Buck, R. O., and Michelson, H. W., Lane Technical High School, Chicago, Ill., *Inclined Lettering for Mechanical and Machine Drawing*, 1932 (Milwaukee, Wis.: The Bruce Publishing Co.).

School Texts

Berg, Edward, Group Chairman, Industrial Arts Department, Washington High School, Milwaukee, Wis., *Mechanical Drawing*, 1942 (Milwaukee, Wis.: The Bruce Publishing Co.).

Johnson, William H., Ph.D., Former Superintendent, Chicago Public Schools, and Newkirk, Louis V., Former Director of Industrial Arts Education, Chicago Public Schools, *Modern Drafting*, 1944 (New York: The Macmillan Co.).

Klenke, William W., Instructor of Drawing in Central Commercial and Technical High School, Newark, N. J., and Hayes, Chas. J., Head of Art Department, International Textbook Co., *Elementary Mechanical Drawing for High Schools*, 1944 (Scranton, Pa.: International Textbook Co.).

Mattingly, E. H., B.S., Director Industrial Arts Publications, and Scrogin, E. H., Commercial Artist and Draftsman, *Applied Drawing and Design*, 1940 (Wichita, Kans.: McCormick Mathers Publishing Co.).

Pawelek, Stanley J., Supervisor of Industrial Education, Baltimore Public Schools, *An Introduction to Drafting*, 1947 (Boston: D. C. Heath and Co.).

Industrial-Arts Cooperative Teacher Training

F. LOWELL JACKSON
Instructor, Industrial Education
The University of Oklahoma
Norman, Okla.

Joe Thomas teaches industrial arts: machine work, drafting, work with hand tools, and so on. To his students, Joe is a link between *study* in school and *work* in industry.

His students ask: "How do you go about getting a job in a factory?" "I want to be a tool- and diemaker." "How can I get started?" "I don't know whether to start work in a shop or a store. What is it like to work in a shop?"

But Joe hasn't had firsthand experience. Upon graduation from high school, he be-

gan his college work immediately; no one encouraged him to spend a year in industry. He never carried a lunch pail, punched a time card, or lined up at the cashier's window for his weekly pay.

After Joe started teaching, he spent his summers back in school working for an advanced degree. Of course, Joe isn't supposed to do guidance and counseling but to his students he is the man with the answers. They look to him for occupational information and advice; he is the one person in the school to whom they can turn for answers to their questions. Joe is an industrial-arts teacher, but he needs shop experience if he is to interpret for his students *working in industry*. This fact is supported by a study of 750 outstanding industrial-arts teachers by G. H. Silvius in 1946.[1] He found that (1) 52.8 per cent of the shop teachers had 41 months or over of industrial experiences, (2) 35.6 per cent were certified to teach Smith-Hughes classes even though they were not teaching in approved Smith-Hughes schools.

Should Joe have had work experience in industry before he began his college work, before he began teaching, before starting work on an advanced degree, or as a part of his college work? Let's discuss these possibilities.

First, Joe may not have been 18 which would have prevented him from getting this experience. Then, if Joe started his work experience before college his experience wouldn't be as meaningful, and he would not be able to sort out the important from the unimportant. Finally if Joe had started his work experience before beginning college, he may not have wanted to stop work and go back to school.

Next, if Joe started his work experience after college and before teaching, other obstacles would arise. For years, Joe has prepared to teach, he is anxious to get started and to try out the things he has learned. He doesn't want to interrupt this natural sequence, training — job, to get outside work experience. Second, he hasn't enough experience in relation to teaching. Third, Joe owes some money for his education, he is anxious to start teaching and to pay it back. About two out of every three students owe for part of their college education. Finally, Joe could not sign up with college placement for teaching interviews if he were to get his work experience at this time. This probably would be a disadvantage.

Now if Joe starts his work experience before he earns an advanced degree, he bumps into the problem of summer school. His board of education recognizes and pays him according to degrees instead of work experiences. Naturally, Joe is going to spend his summers in school. Then too, if Joe tells an employer that he wants a job for three months, he isn't very likely to get one. Most employers feel that they lose money on employees for the first six weeks of employment.

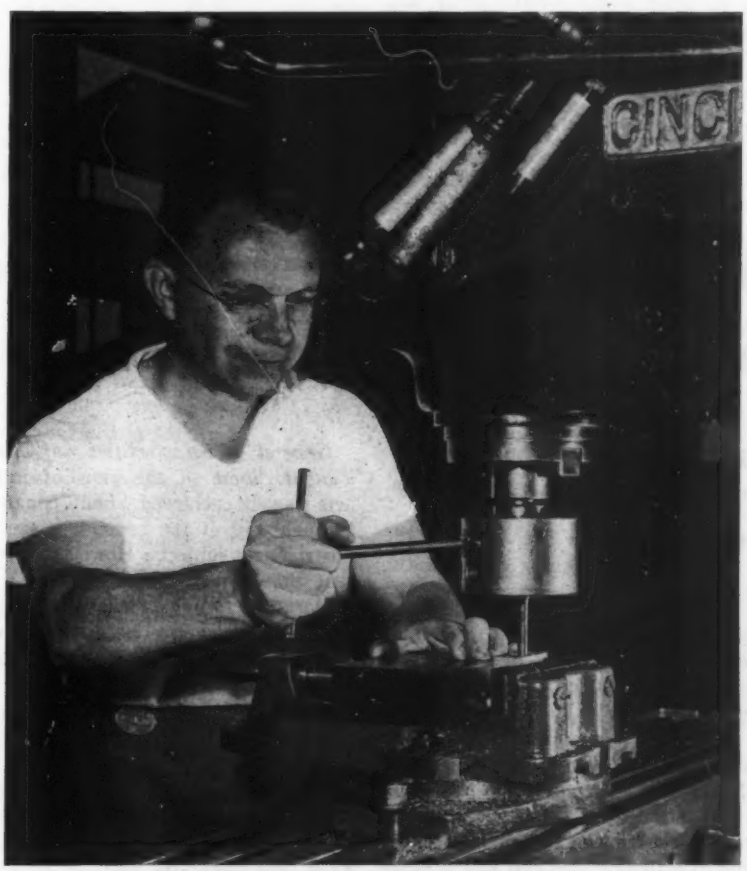
It would seem that the best time for Joe to get his work experience is after some teaching experience and as a part of his college work.

What are the advantages of a work-experience program? Let us take a look at what is being done at Wayne University.

Wayne co-operates with the Industrial Education Department of Chrysler Corporation, in a Co-operative Teacher Training Program. The teacher not only gets a wide experience with many production jobs but has opportunity to see a large corporation from the inside, to listen to executives explain their jobs and discuss their problems, and to find out firsthand the level of preparation and ability a student must have to fit successfully into industry.

In the 1947 summer program session 30 in-service industrial-arts teachers that participated, worked 40 hours a week at the rate for college students in the co-operative plan. Two hours each day were spent in the classroom. Guest speakers included B. E. Hutchison, vice-president of the Chrysler Corporation who talked on "History and Finance of the Corporation"; Dr. John J. Lee, dean, Graduate School, Wayne University, who talked on "Trends in Higher Education."

In a co-operative program the teacher's manipulative skills are brought up to date. He receives training on special lathes, hobs, and broaching machines. This not only helps the teacher but also his students when he goes back to his teacher duties. Second, the teacher is able to meet his college expenses. Third, job training is more meaningful in a co-operative program, since in-service teachers have the experience and education to appreciate the values of attitudes, abilities, and personalities that industry believes to be important. Next, the teacher has contact with other teachers, gets to know their problems and situations and has a chance to study *the student on the job*. He gets a better understanding of



Submitted by F. Lowell Jackson, instructor of industrial education, University of Oklahoma, Norman, Okla.

[1] Silvius, G. Harold, *Instructional Units for Professional Courses in Undergraduate Industrial Arts Teacher Education*, Pennsylvania State College, 1946.

industry, and appreciates the need for more *personality* work with students. Finally the teacher participating has access to all the related departments. He has the use of the medical, inspection, drafting, guidance and testing, and visual aids departments. For example, the medical department found that one of the 1947 summer program teachers had a conjested lung which had not shown on previous X rays. He was advised to drop all but necessary activity and invited to report for an additional X ray later. Rest periods corrected the condition.

How do the teacher participants like the summer program, do they feel that it is worth while? When asked, "Do you feel this experience was altogether worth while, or do you think in some respects it was not too valuable?" Eighty-eight per cent of the Chrysler group reported "altogether worth while." When the teachers were asked, "Do you feel that you now have a better understanding of the problems that business faces in producing goods and giving employment?" Ninety-two per cent of the Chrysler group reported in the affirmative. When asked if they thought other educators would respond favorably if companies in other towns offered tours and seminars like the one participated in, 93 per cent of the Chrysler group said "yes."[2]

[2]*The Public Opinion Index for Industry*, "Industry and the Social Science Teacher." Opinion Research Corporation, Princeton, N. J. A report on the teacher program for the years 1943–46 inclusive.

More colleges could set up an undergraduate program of work experience that is co-ordinated with classroom work so the student would receive a maximum benefit. Let's take a look at several possibilities. Here is a five-year part-time co-operative plan that is working at Wayne University.

It is possible to complete a four-year curriculum in five years by taking eight hours of college work each semester and four hours in summer session. Eighteen hours' credit must be earned as a full-time student the last two semesters.

THE FIVE-YEAR PLAN

Time Schedule for Part-Time Students:

Working Hours:
Plan I — 7:00 a.m. to 3:00 p.m.
Plan II — 3:00 p.m. to 11:00 p.m.
University Classes:
Plan I — 4:30 p.m. to 8:45 p.m.
Plan II — 9:00 a.m. to 1:00 p.m.

	Semester I	*Semester II*	*Summer session*	*Total hours*
Graduate from high school			4	4
1st year	8	8	4	24
2nd year	8	8	4	44
3rd year	8	8	4	64
4th year	8	8	4	84
5th year	*18	*18	4	124

*Full-time student at the University.

If Plan II were selected by the student it would be possible for him to enroll in regular classes of the school, however, if Plan I were selected special evening classes would have to be organized.

A *one-semester* work-experience program could be set up in the third year of school. Four hours could be assigned for manipulative credit, the student could earn another four hours Saturday morning and two hours by electives in evening classes. Thus ten hours could be earned during the semester of participation.

A *two-semester* work-experience program could be set up by using the entire third year for school. It would be possible for the student to earn twenty hours of credit during the two semesters. Then, by earning 16 hours in two summer terms, the student would be back in school the fourth year as a regular student.

It seems that if the schools are to be a maximum benefit to the community, state, and country there must be some programs such as the teacher-training program set up to be more meaningful and functional to a greater number of the students participating. We should throw away the Chinese slogan, "That which is old is good," and move toward a position of serving the individual student to a better advantage so he can be of better service to himself, his family, and the community in which he lives.

Matching Men and Jobs—Reorganizing The Industrial-Arts Curriculum

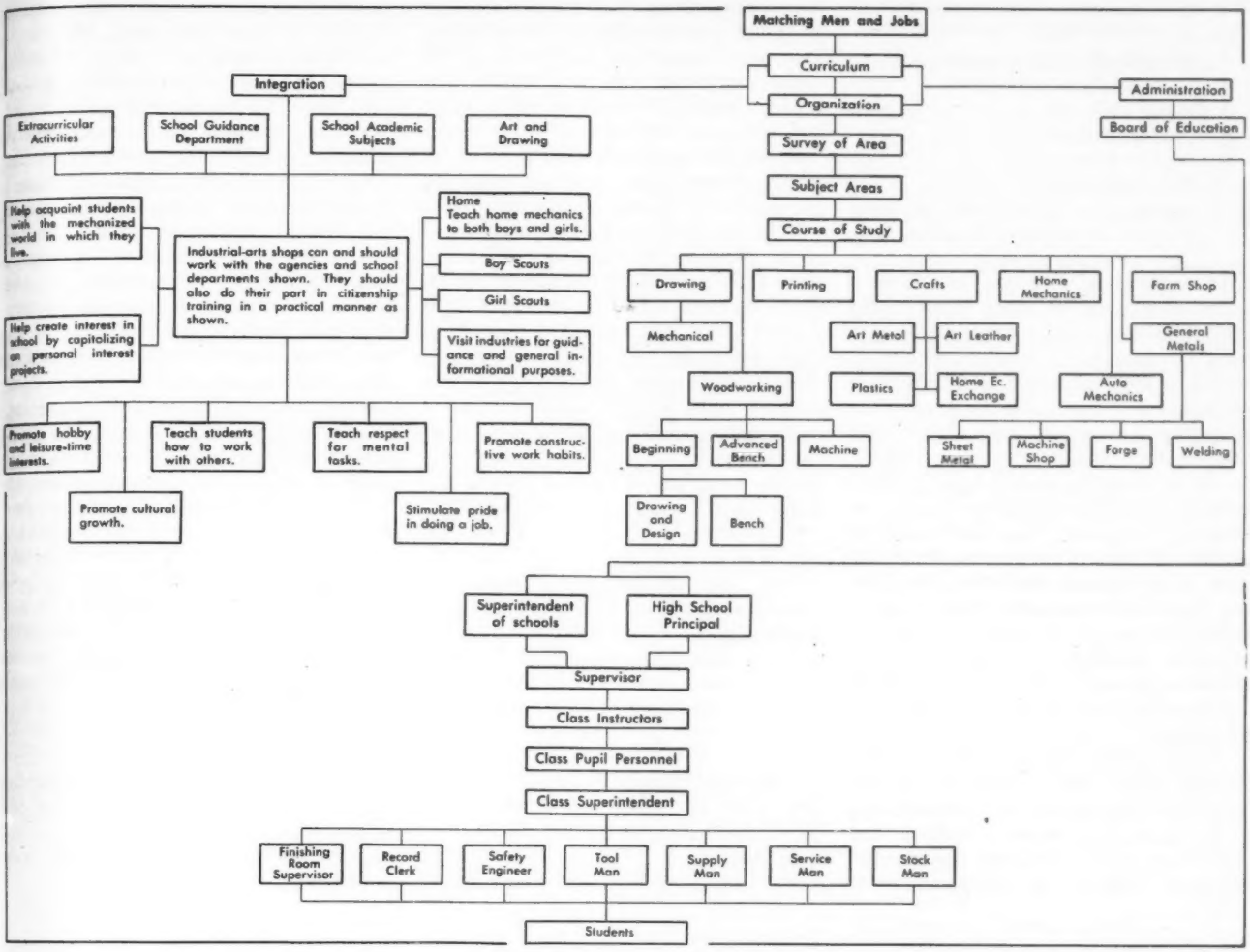
RALPH O. JOHNSTON
Supervisor of Industrial Arts
High School
Anthony, Kans.

To match men (students) *and jobs,* is educating for successful living, and must be the primary objective of all schools. The school must give students an opportunity to contact and study those pursuits which they will later follow, whether that requires them to go on to college, finish high school and then go into an occupation, or drop out of school at some stage and go to work. The foregoing is the reason for a program of matching men and jobs through the reorganization of the industrial-arts curriculum.

General Characteristics of Subjects Taught. Some of the aims of industrial arts can be achieved about equally well through any of the commonly taught industrial-arts subjects. However, to the extent that industrial-arts subjects have an exploration for guidance value, those occupations which can be made representative of a group of closely related occupations are certainly the ones which should be selected for the exploratory emphasis. They should have educational and guidance values for all students.

A falacious theory formerly existed that industrial-arts offering should be influenced materially by industries represented in the local community. It must be remembered that today a large percentage of students do not work later, as adults, in the locality in which they were educated. As evidence of this, findings of studies that have been made by L. P. Ayres indicate that as far back as 1913, only one father out of six, of 13-year-old boys in public schools in 78 cities of 23,000 to 200,000 population was born in the city in which he was living. Further, it has been discovered that only 58 per cent of those 13-year-old boys were born in the city in which they were living. As a part of general education, industrial-arts subjects must be representative of trades and industries of the nation if they are to have significance in guidance. Industrial arts should be essentially the same in all communities — metropolitan, suburban, and rural.

Commonly Taught Industrial-Arts Subjects. A number of studies show a very



Matching men in jobs

decided trend toward differentiated industrial-arts offerings. Emphasis has rapidly shifted away from just woodwork and mechanical drawing. The rise of the general shop in its various forms was one answer to the demand for a greater number of industrial activities.

Time Devoted to the Subjects in an Industrial-Arts Curriculum. Courses run 6, 8, 9, 10, 12, 18, 20, 36, and 40 weeks in length depending on their (1) purpose, (2) place in a series of courses, (3) the number of weeks in a school year. Clock hours in a course should be taken into consideration. Beginning courses cover fewer clock hours than more advanced courses.

Integrating Academic Courses With Industrial-Arts Courses. Industrial-arts courses should be organized to stimulate thinking and to help put into practical use subject matter acquired in regular academic courses. Mathematics and science can be correlated quite readily and made very interesting through industrial-arts activities. It cannot all be done in the shop. The regular academic instructors need to work with the industrial-arts instructors and carry some shop problems into their classroom for consideration.

Analysis

A curriculum may be thought of as a series of integrated subjects, each of which should have a well-organized course of study.

Who should plan the curriculum? Probably the legally constituted educational authority will assume this responsibility. However, no specific group should do the planning, as the schools belong to the people. In many instances, nonprofessional groups have made profound changes in school programs. Establishing the curriculum is done for the teacher, or it is done by the teacher in conjunction with administrative school officials. In one-teacher industrial-arts departments, the subjects an instructor teaches comprise the entire industrial-arts curriculum. In many places, industrial-arts teachers are consulted regarding their curriculums. Because many of these teachers influence the changing of curriculums, it is well that they know something of the setting up or organization of the curriculum in industrial arts.

Organization of Planning a Curriculum. Planning is by no means a new idea in America. In many respects it is as old as the nation and so inseparably related to our democratic form of government that it may be considered an essential of democracy.

Some suggested techniques:

1. Hearing board
2. Co-operative research
3. Planning periods
4. Advisory committee
5. Basic surveys

Planning on local levels:

1. Youth and lay participation
2. Educator and lay planning councils
3. Basic surveys on local level

4. Problems in planning for local schools

Planning on state level:

1. Self-evaluative state reports
2. Basic survey at state levels
3. School buildings
4. Curriculum building
5. Teacher education
6. Higher education
7. Organization for state-wide planning
8. Problems for planning at state levels

Integration. All industrial-arts courses, to function properly, must be organized as integral parts of general education. They must be open to all students and made flexible to meet individual needs. Skills are incidental to constructive thinking. Care should be exercised to keep all activities within a boys' world. All projects or jobs, as far as possible, should have personal interests. Supplemental information having general practice and cultural values should parallel all shop activities. Interests that have an avocational carry-over into later life should be stimulated. Shop progress cannot be measured simply by projects produced, but rather by results involving attitudes, interests, and growth in putting into practical use a combination of general information.

Administration. The industrial-arts curriculum should keep in mind the student as the one purpose for the administration of the course. The course is built for and around the student. Although the board of education delegates the administration to the superintendent of schools who in turn gives the responsibility to the principal, then to the supervisor and finally to the course instructor, the class still belongs to the students. The students will be eager and willing to have it their class, run it well, and soon eliminate most or all of the class problems when they are under the guidance of a capable instructor.

Pupil personnel is the answer to many of the problems that may arise. The students placed in charge can handle routine duties and will take pride in them, for it is their class. The instructor, relieved of these duties, has more time for the individual members of the class. Thus the students learn to work with someone of their own group in authority. This practice makes a life situation in the shop course, and helps the students develop correct attitudes, co-operation, dependability, and industry. Improvement, pride, and joy of good workmanship, will naturally follow. The establishment of rules and regulations, by co-operative action between students and the instructor, will help the students take pride in keeping things in order. They will begin to feel more and more that the class belongs to them.

Summary

Conclusion. America's school system is now what the hopes and desires of the people have made it. Its future also rests with them.

Curriculum making is the establishing of a number of subjects (each with a course of study) in some determined order which it is believed will bring about desirable changes in pupils. Subjects and courses in the industrial-arts curriculum must be timed as to length in clock hours and properly placed in the school levels. Exploratory and finding courses for guidance should sample a number of the common and typical industrial occupations. Electricity and radio, home mechanics, art crafts, sheet-metal work, auto mechanics, and printing classes are growing in numbers as industrial-arts tryout courses.

It is becoming increasingly evident that the student in industrial-arts should have some instruction in consumer education, and appreciation and evaluation of products in more fields in this modern social world in which he is living. Too little has been developed in the line of leisure-time hobbies and interests, and this should play an increasingly greater and more important part in curriculum reorganization. The program proposed in the foregoing is not looked upon as a solution to the entire problem. It is merely a tentative method of creating a good sound basis for developing a more complete and more flexible industrial-arts program to which can be added other areas.

The foregoing charts show the correlation of integration, organization, and administration in the industrial-arts curriculum. Organization, and the others, may be extended to any desired length.

Needed and Wanted—More Knowledge About Electricity and Its Uses

R. W. ADAMS
Associate Professor of Industrial Arts
Colorado State College of Education
Greeley, Colo.
and

H. H. LONDON
Professor of Industrial Education
University of Missouri
Columbia, Mo.

Electricity is one of the truly great wonders of our age. Understood and controlled, it is a safe and ready servant; misunderstood and uncontrolled, it may be a force for destruction and death. Few other single factors have brought about such sweeping changes in our mode of living. Generated by steam and water turbines located in out-of-the-way places, electricity has for years been *piped* into the towns and cities of the nation, there to turn the wheels of industry and to provide light, heat, refrigeration, communication, transportation, and other services. More recently, with the passage of the Rural Electrification Act of 1935, power lines have spread like a vast spider web over rural America, bringing modern conveniences, relief from drudgery, and greater operating efficiency to hundreds of thousands of farm homes. But the job of electrifying the rural homes of the nation is by no means complete. Neither is effective use being made of electricity by many farm and city dwellers who have this service.

Safe and effective use of electricity in the city and on the farm involve, in many cases, additional power lines and electrical appliances, more adequate current supply, and better installation and maintenance service. However, a recent study[1] reveals that the crux of the problem is the education of the people themselves as consumers of electricity — what it can do for them, how to select and install equipment, and how to operate and care for it. This is the

[1]Robert Wayne Adams, *Educational Needs of Residents of Electrified Farms Concerning the Use of Electricity*, unpublished Doctor's Dissertation, University of Missouri, 1947.

problem that confronts the R.E.A. co-operatives throughout the country in their efforts to expand and improve their services. It is likewise a problem for those who manufacture, distribute, and service electrical appliances and equipment. It should be of interest to the various educational agencies, including the school shop, which are at work to raise the standard of living among rural and city people.

In an effort to ascertain the specific educational needs and interests of farm families with respect to the use of electricity, facts and opinions were sought from 2085 operators of electrified farms and from more than 700 professional workers, including (1) managers of electric co-ops, (2) county agents, (3) home demonstration agents, (4) vocational agriculture teachers, (5) vocational home-economics teachers, and (6) industrial-arts shop teachers.

Need for a Greater Knowledge of Electricity

The six groups of professional workers were asked questions dealing with the benefits now obtained by farm families from the use of electricity and the possibility and desirability of improving these through education. These questions and the replies follow:

Question 1. Do you believe that most residents of electrified farms are obtaining the maximum benefits possible in their situation from the use of electricity on their farms?

Replies:	*Per cent answering Yes*	*Per cent answering No*
Co-op managers	0	100
County agents	0	100
Vocational agriculture teachers	1	99
Industrial-arts shop teachers	7	93
Vocational home-economics teachers	8	92
Home demonstration agents	11	89

Question 2. Do you believe that most residents of electrified farms would utilize electricity more effectively if they knew more about electrical equipment and its possible uses on the farm?

Replies:	*Per cent answering Yes*	*Per cent answering No*
Co-op managers	100	0
County agents	100	0
Vocational agriculture teachers	99	1
Vocational home-economics teachers	99	1
Home demonstration agents	96	4
Industrial-arts shop teachers	96	4

Question 3. Do you believe that it would be desirable if more were done in your community or service area to assist rural residents in learning more about the use of electricity on farms?

Replies:	*Per cent answering Yes*	*Per cent answering No*
Co-op managers	100	0
County agents	100	0
Home demonstration agents	100	0
Vocational agriculture teachers	99	1
Vocational home-economics teachers	98	2
Industrial-arts shop teachers	98	2

Do Farm Families Want to Learn About Electricity?

Regardless of how desirable it may seem for farm people to learn more about the use of electricity, it was realized that little can be done about it unless these people are interested in learning. To find out the extent of their interests, farm operators were asked the following questions:

Question 1. Would you, as operator of an electrified farm, wish to learn more about electricity and electrical equipment if you could do this in a way that was convenient and inexpensive?
Responses: Yes — 65% No — 5% No response — 30%

Question 2. Would your wife wish to learn more about electricity and electrical equipment if she could do this in a way that was convenient and inexpensive?
Responses: Yes — 63% No — 8% No response — 29%

Question 3. Would you wish your son (if you have one) to learn more about electricity and electrical equipment if he could do this as a part of his high school work?
Responses: Yes — 46% No — 1% No response — 53%[2]

Question 4. Would you wish your daughter (if you have one) to learn more about electricity and electrical equipment if she could do this as a part of her high school work?
Responses: Yes — 41% No — 3% No response — 56%[2]

Further evidence of interest in learning more about the use of electricity is found in the following comments of operators of electrified farms:

We should like to attend classes to learn more about electricity and wiring, if it were convenient so that we could go.

It would be nice to give all the (co-op) members some instructions in wiring and repairing electrical appliances, and I am quite sure most all of us would be glad to learn more.

Would be interested in joining a group whereby I could learn more about how to get the most good from my electricity, namely, appliances advisable to buy and how best to use them, how to take care of equipment, how to make minor repairs, and how to plan an outlay to take care of future needs.

[2]It is most probable that many of these respondents had no sons or daughters of high school age.

What Farm Families Should Know About Electricity

Both farm operators and professional workers were asked to indicate what they believed *men, women, boys,* and *girls* living on electrified farms should know about electricity. There were some differences in opinion between the farm operators and professional workers regarding the nature and extent of these needs. A *majority of both groups,* however, believed that farm people should know the following things about electricity and electrical equipment.

How to:	*Girls*	*Women*	*Boys*	*Men*
1. Select and purchase household electrical equipment	*	*	*	*
2. Operate and care for household electrical equipment	*	*	*	*
3. Estimate the cost of operating household electrical equipment	*	*	*	*
4. Read a meter and figure a monthly electrical bill	*	*	*	*
5. Avoid overloading circuits and blowing fuses	*	*	*	*
6. Select and replace fuses	*	*	*	*
7. Plan the lighting of a room or building	*	*	*	*
8. Make simple repairs on household electrical equipment			*	*
9. Locate and eliminate the causes of blown fuses			*	*
10. Determine whether or not it would be profitable to buy electrical equipment			*	*
11. Plan the wiring of a building				*
12. Select and purchase nonhousehold electrical equipment				*
13. Operate and care for nonhousehold electrical equipment				*
14. Estimate the cost of operating nonhousehold electrical equipment				*
15. Make simple repairs on nonhousehold electrical equipment				*
16. Change hand-operated machines to electrically operated machines				*
17. Rig up a portable motor				*
18. Install new lighting or convenience outlets and switches				*
19. Install a new circuit in a building				*
20. Wire a building for electricity				*
21. Do special wiring required in installing electrical equipment				*
22. Make major repairs and adjustments on electrical equipment				

Electrical Equipment in Use on Farms

In planning an educational program to meet the needs indicated in the above list of statements, it is necessary to know also what items of electrical equipment are possessed by farm families. Accordingly, below are summarized facts obtained in the Missouri study concerning the nature and extent of the electrical equipment in use on the farms of that state in 1947.

Buildings wired for electricity. The ten farm buildings most frequently wired for electricity and the per cent of farmers who reported each are as follows:

	Per cent		Per cent
House	99	Garage	23
Barn	48	Workshop	18
Brooder house	30	Dairy barn	14
Chicken house	28	Granary	8
Smokehouse	24	Cellar	4

More than 90 per cent of all buildings wired were included in this list of ten.

Household electrical equipment. The leading items of household electrical equipment possessed by farm families and the per cent of farmers who reported possession of each are as follows:

	Per cent		Per cent
Electric iron	96	Vacuum cleaner	37
Radio	92	Electric fan	36
Lamps	77	Heating pad	32
Washing machine	68	Range	18
Refrigerator	58	Coffee maker	15
Toaster	51	Water heater	8

This list of 12 items includes more than 95 per cent of all household electrical equipment possessed by farm operators in Missouri.

Nonhousehold electrical equipment. The principal items of nonhousehold electrical equipment used on Missouri farms together with the per cent of farmers who reported possession of each item are as follows:

	Per cent		Per cent
Yard light	55	Milking machine	4
Water pump	30	Milk cooler	4
Chicken brooder	21	Feed grinder	3
Portable motor	13	Cream separator	3
Electric fence	12	Soldering iron	2
Tool grinder	12	Dairy water heater	1

Ways to Do the Job

The professional workers consulted in the study were asked to indicate what they believed to be desirable ways of assisting farm people to learn more about the possibilities and uses of electricity. Many ways were suggested, but a majority favored these means:

For Farm Men and Women

1. *Include instruction* dealing with the use of electricity on the farm in the regular *educational programs* of *agencies now serving rural communities.* (County agent, home demonstration agent, etc.)
2. *Conduct short courses* dealing with the use of electricity on the farm for residents of electrified farms in the community.
3. *Distribute educational literature* dealing with the use of electricity on farms to residents of electrified farms in the community.

For Farm Boys

1. Include instruction dealing with electricity on the farm in *agriculture courses* in high school.
2. Include instruction dealing with the use of electricity on farms in programs of such rural youth organizations as *4H Clubs, Future Farmers of America,* etc.
3. Include instruction dealing with electricity on the farm in high school *science courses.*
4. Include instruction dealing with electricity on the farm in *industrial arts shop courses* in high school.

For Farm Girls

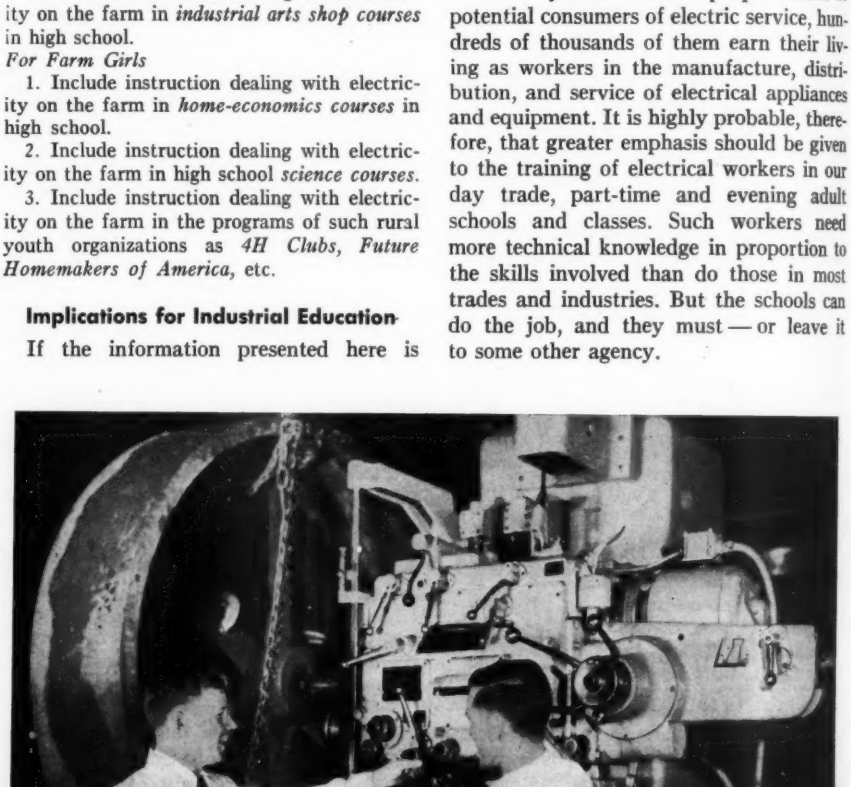
1. Include instruction dealing with electricity on the farm in *home-economics courses* in high school.
2. Include instruction dealing with electricity on the farm in high school *science courses.*
3. Include instruction dealing with electricity on the farm in the programs of such rural youth organizations as *4H Clubs, Future Homemakers of America,* etc.

Implications for Industrial Education

If the information presented here is fairly representative of the situation generally on the farms of the nation as regards the use of electricity and the need for knowledge about its use, then there is a big job to be done in practical education. A similar study of the use of electricity and the need for knowledge about it on the part of urban people would most probably reveal similar results.

The industrial-arts teacher, by reason of his training and equipment, is in a position to make a major contribution in teaching electricity from the consumer's standpoint. And unless we place more emphasis on electricity in our industrial-arts programs, which we have neglected too long to do, some other agency is likely to take over the job of teaching applied electricity.

Not only are all of our people actual or potential consumers of electric service, hundreds of thousands of them earn their living as workers in the manufacture, distribution, and service of electrical appliances and equipment. It is highly probable, therefore, that greater emphasis should be given to the training of electrical workers in our day trade, part-time and evening adult schools and classes. Such workers need more technical knowledge in proportion to the skills involved than do those in most trades and industries. But the schools can do the job, and they must — or leave it to some other agency.



Boring a drive wheel on a horizontal boring mill. Submitted by W. H. Lewis, director of vocational training, Tennessee Polytechnic Institute, Cookeville, Tenn.

Some Leaders in Industrial Education

WILLIAM T. BAWDEN
Director of Publications
Kansas State Teachers College
Pittsburg, Kans.

James Huff Stout

(Continued from page 311 of the October, 1948, issue)

In 1846, a number of families settled at a place in northwestern Wisconsin which was later named Menomonie. Two years later, in 1848, the first sawmill was established in the village by Knapp, Stout and Company, one of the largest lumber manufacturing concerns in the country. James Stout's father, Henry L. Stout, one of the principal stockholders, made his home in Dubuque, Iowa, where James was born on September 25, 1848.

The mill at Menomonie was a success and in a few years the main offices of the Company were moved to Menomonie. As the number of employees increased, and other families were attracted to the village, the lumber firm, at its own expense, opened a one-room school in order to provide a common school education for the children of the community. This school was taken over by the public school system which was established in due time and supported by public taxation.

Early Life

James attended the public schools in Dubuque and spent one year at the Old University of Chicago. In 1867, at the age of 19, he entered the service of Knapp, Stout and Company, at Dubuque, where the Company maintained an office and extensive lumberyards. He spent a number of winters in the lumber camps of the company and took part in the logging operations. When not in the woods he worked in the mill. Later, for nine years, he was in charge of the Company's rafting business between the junction of the Chippewa and the Mississippi Rivers and St. Louis. In 1880, the Company built a new sawmill at St. Louis, and James went there to take charge of it. He remained in St. Louis until 1889, in which year he came to Menomonie.

During the period of his residence in St. Louis, he spent two years in Washington, D. C., as a representative of the lumber companies in a dispute with the railroads about the height of the bridges over the Mississippi River at St. Louis. Through patience and diplomacy he finally won, convincing Congress of the justice of his cause. During these two years he made the acquaintance of many public men of national influence, an acquaintance which was greatly extended later through his activities in the field of education.

Interest in Education

It was in St. Louis that Mr. Stout became interested in education. A friend remarked one day in his hearing that he would like to send his three boys to the Manual Training School, recently established by Dr. Calvin M. Woodward in connection with Washington Unviersity, but that he could not afford the expense. Mr. Stout volunteered to take care of the expense, and his offer was accepted.

Because of this personal connection, Mr. Stout observed the methods and results of this new idea in education with more than casual attention, and his interest was aroused. He made a number of visits to the Manual Training School, studying the equipment and the courses of study with great care. He talked with the three boys about their work and what they were getting out of it. He also talked with Dr. Woodward and the instructors to get an insight into the aims and purposes of the work offered.

Helping the three boys through the Manual Training School was not an isolated instance, but was just one more illustration of Mr. Stout's generous readiness to help young men seeking self-improvement. It also marked the beginning of the inspiration that ultimately led to the giving of funds for the founding of Stout Institute. While still living in St. Louis he determined that some day he would found a Manual Training School patterned after that of Dr. Woodward, but incorporating certain features which he conceived as improvements.

James Huff Stout

When a short time later he came to Menomonie, he at once began considering ways and means of carrying out his ideas in connection with the local school system. At that time, 1889, manual training had found a place in not more than one or two Wisconsin cities, and then only in a modest way in the high school.

One feature, missing from the St. Louis school, which he wished to see incorporated was some corresponding provision for girls. On one of his eastern business trips he learned of the Toledo Manual Training School, Toledo, Ohio, which opened its doors on December 5, 1885. This was the first such school in the United States to provide work for girls as well as boys. "Advice concerning the manual work for girls was received from Emma P. Ewing, dean of the School of Domestic Economy, Iowa State College, Ames."

The Beginning

For the convenience of the student, I may set down here the names, places, and dates of the earliest Manual Training Schools in the United States, following Mr. Bennett's chronology.

The earliest manual training high school in the United States was not a tax-supported public school, but the Manual Training School of Washington University, St. Louis, Mo. The "ordinance" adopted by the board of trustees establishing the school was dated June 6, 1879; the building for the new school was completed during the summer of 1880; and it opened on September 6, 1880, with an enrollment of 50 boys.

It should be noted that the School of Mechanic Arts, in Boston, Mass., was established as a "department" of the Massachusetts Institute of Technology. Although of secondary grade, it did not have independent status. Its creation was authorized by action of the board of trustees on August 17, 1876, and it opened its doors on October 1, 1878.

The Chicago Manual Training School was the second of this type, opened on February 4, 1884. It was a private school also, founded by the Commercial Club of Chicago.

The third manual training high school, and the first to be supported at public expense as part of a city school system, was opened in Baltimore, Md., on March 3, 1884. Like the Chicago Manual Training School, the Baltimore school was modeled after the one in St. Louis.

The fourth manual training high school, and the second to be supported at public expense, was the Philadelphia Manual Training School, which opened in September, 1885.

The fifth manual training high school, and the first to provide work for girls as well as boys, was the Toledo Manual Training School, which opened on December 5, 1885. This school was part of the public school system of the city. The first principal was a graduate of the St. Louis Manual Training School.

The sixth Manual Training School to be established was The Technical School of Cincinnati, Ohio, which opened in November, 1886. The school was founded and managed by a corporation, and about half the funds for operation came from the Commercial Club of Cincinnati. The first principal came from the St. Louis Manual Training School, where he was an instructor. In 1901, the School was taken over by the University of Cincinnati and moved to the University campus.

The seventh, the Manual Training School at St. Paul, Minn., opened in September, 1888, with Charles A. Bennett as principal, a graduate of Worcester Polytechnic Institute. This school was part of the public school system.

Other schools were established by private donors, and among these should be mentioned:

1886, the Manual Training School of Tulane University, New Orleans, La.

1887, Pratt Institute, Brooklyn, N. Y.

1888, Rindge Manual Training School, Cambridge, Mass.

1891, Senator Stout made his first gift for a building for manual training and domestic economy, in Menomonie, Wis.

1892, the DuPonts made possible the Manual Training School in Louisville, Ky.

1896, the Hackley Manual Training School, Muskegon, Mich.

In the public schools the development soon took the form of an argument over the comparative merits of the manual training type or technical high school and the so-called "composite" high school. Advocates of the latter type urged that every high school, at least in the larger cities, should offer all branches and departments that properly belong in a secondary school.

It is to be noted that manual training for boys and household arts for girls did not spread rapidly through the high schools of the country until well after 1900, chiefly because there was lacking an adequate supply of trained teachers.

Background Influences

It is impossible to estimate how much of the development, outlined in the foregoing, which had been going on in various sections of the country was known to Mr. Stout, but we do know that he had studied the manual training schools in St. Louis and Toledo at first hand. It is also known that in the earlier stages of the Menomonie school he consulted frequently with Dr. Henry H. Belfield who was the first principal of the Chicago Manual Training School when it opened in 1884, and who remained with the School until some time after it became a part of the School of Education of the University of Chicago, and was moved into a new building on the University campus about 1905.

It is to be noted also that Mr. Stout began to consult with Mr. Harvey about the details of his educational plans several years before the latter first went to Menomonie. Mr. Stout was elected to the State Senate in 1894, which was during the period of Mr. Harvey's principalship of the Milwaukee Normal School, 1892-98. Their acquaintance quickly ripened into a close personal friendship which continued unbroken until Mr. Stout's death in 1910.

Mr. Stout's interest in the common school child was by no means confined to manual training and household arts. Another feature observed in the St. Louis schools that appealed to his imagination as well as to his sense of the practical was the kindergarten. With the approval of the board of education, he arranged to have two kindergartens opened in Menomonie. Again he furnished the funds for the erection and equipping of two buildings for this purpose, and turned them over to the city. He also provided funds for the salaries of the teachers and met all the expenses of maintenance and operation for several years until the board of education was able to include the kindergartens in the budget.

The Training of Teachers

Among the significant developments in Mr. Stout's plans for which Mr. Harvey's advice and suggestions were more or less directly responsible was a growing interest in the work of preparing teachers. Beginning in 1899, upon the recommendation of Mr. Harvey, Mr. Stout established a department for the preparation of kindergarten teachers. And soon after the reorganization of 1903, to be discussed further on, a course for the training of primary teachers was added. Each course was two years in length, based on graduation from a four-year high school.

In order to forestall possible criticism on the part of the State Normal Schools, and of the public schools which were the prospective employees of the graduates, the two teacher training programs were placed under the control of the Menomonie board of education.

The school for the training of kindergarten teachers was discontinued in 1909. By that time the State Normal Schools had developed effective departments and were graduating well-prepared teachers. Further, it was becoming more and more apparent that the future contribution of the Stout Institute was to be in the preparation of teachers of manual training (later industrial arts) and domestic economy (later homemaking). It was evident that the preparation of kindergarten teachers was not a logical or essential part of this rather specialized program.

First Gifts to Menomonie

Mr. Stout's first move in Menomonie was to furnish the funds with which to erect and equip a two-room building to be devoted to manual training for the boys and homemaking for the girls. In

addition, at his own expense, he paid the salaries of the teachers for these two new lines of work.

The school opened January 5, 1891, with classes in joinery and mechanical drawing for boys, and sewing, cooking, and freehand drawing for girls, offered to all high school pupils. The first principal of the Stout Manual Training School was R. B. Dudgeon, and as instructors in manual training and domestic science he was assisted by three recent graduates of the Toledo Manual Training School.

After two terms a complete change took place in the teaching force. J. E. Hoyt succeeded Mr. Dudgeon as superintendent of the Menomonie schools, principal of the high school, and head of the Stout Manual Training School. John H. Mason, a graduate of Worcester Polytechnic Institute, who had had considerable experience as a draftsman and teacher of manual training, became head of the mechanic arts department. Miss Gertrude Coburn, a graduate of Kansas State College of Agriculture and Applied Science, was appointed director of the work in domestic arts.

The work soon became so popular that students could not be accommodated in the limited space afforded by these two rooms, and Mr. Stout proceeded to erect a much more commodious building and equipped it for a much wider range of work in both departments. Equipment was provided for work of various kinds, forging, foundry work, and machine-shop practice. The advantages offered by this new building and its splendid facilities were appreciated by the students of the school and the popularity of the work increased. Instruction in drawing throughout the grades of the public school was also introduced about the same time, and rooms for the art department were provided and equipped in this new building.

(To be continued)

Cyanide Hardening

LESTER F. SPENCER
Kensington, Conn.

One of the most frequently used processes in the heat-treatment of steels is the cyanide method of casehardening. It produces a thin, wear-resistant case or outer skin which is utilized for many applications where slight wear may defeat the purpose of the item. Classical example of an item of this type are automotive gears. But before describing cyanide hardening it is well to study the data sheet, "Cautions in Handling Cyanide and First Aid Treatment," prepared by E. F. Houghton & Co., manufacturers of heat-treating materials.

The first consideration is the type of furnace employed in the cyanide process. The most common furnace employed is the cylindrical or rectangular shaped pot furnaces shown in Figures 1 and 2. It primarily consists of a steel shell with reinforcing bands, fully insulated to conserve heat and maintain the bath at a given temperature; a container usually made of a

(Continued on page 359)

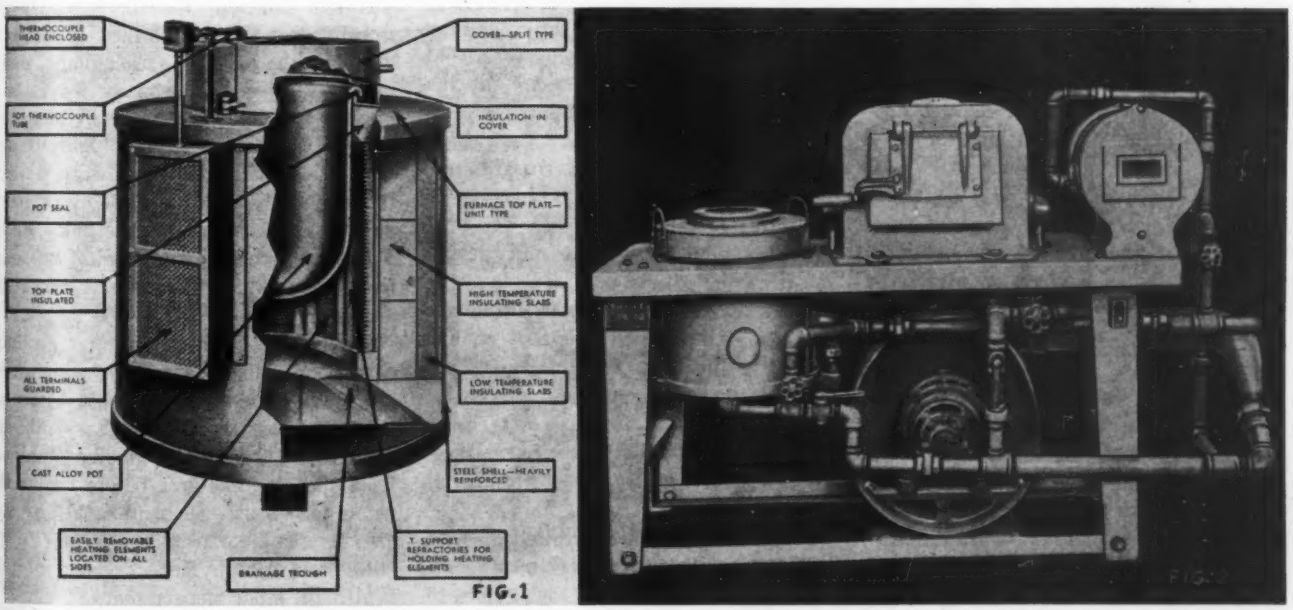


Fig. 1. Typical cylindrical pot furnace used in cyanide hardening. The principal components are listed. Source of energy — electricity — Courtesy, Hevi Duty Electric Furnace Co., Milwaukee, Wis.

Fig. 2. Popular combination of pot furnace, medium heating furnace, and high-speed furnace made by Chicago Flexible Shaft Co. This is a common type of furnace used in vocational schools. Source of energy — gas — Courtesy, Stewart Industrial Furnace Division, Chicago Flexible Shaft Co., Chicago, Ill.

Industrial Arts and Vocational Education

John J. Metz, Editor

A CODE OF ETHICS FOR INDUSTRIAL-ARTS TEACHERS

Now that several weeks of the new school year have passed, and teachers and pupils are again becoming accustomed to the routine which schoolwork imposes, it may be well to spend a few moments in getting a mental picture of what the teacher's obligations are to his students, to the community, and to the representative board of education, and the executives which it has appointed.

On page 253 of the June, 1948, issue of INDUSTRIAL ARTS AND VOCATIONAL EDUCATION, Dr. Heber Allen Sotzin presented our readers with an ideal code of ethics which may well be the subject of a short meditation for the teacher at this time of the school year. Dr. Sotzin's code gives an excellent picture for what the teacher should strive. It outlines very well just what the teacher must do so that he may be in condition to carry out the exacting duties of his profession. It also directs the teacher's attention to what he owes to those with whom and for whom he works. Dr. Sotzin expresses this throughout the statements of the code which he presented. To quote his words, "I will strive to work harmoniously, efficiently, and effectively with others. I will be motivated in my work by a sense of fairness, by honesty, justice, and patience. I will sustain and extend my interest in youth; and try to understand the problems of young people and to help solve them."

These few sentences cover a wide area and touch upon many of the contacts which the teacher makes while carrying out his professional activities. It is not enough that the teacher is fair, honest, just, and patient with his students. That, of course, is necessary if he wants to carry on his teaching duties in the proper manner. But he must also remember to be fair, honest, just, and patient, with the parents of these students, with his fellow members on the faculty, with the members of the board, and the administrators in whose hands lies the conduct of the school, and with the community at large.

Especially must the teacher be careful to keep an open mind on his dealings with the supervisors, principals, or directors of his school or subject. Should internal troubles arise in the conduct of the school, he must be careful to maintain a loyal attitude as far as his words and actions are concerned in his contacts with students and the public. If the school is to do its best, the orders of those who have administrative charge of it must be followed, for they are responsible and have, or should have, a better over-all view of the objectives of the school than does the individual teacher. Any other conduct will produce chaos and jeopardize the education and future of the students for whom the school is primarily erected.

The rest of the suggestions contained in Dr. Sotzin's code are self-explanatory and it is well not only to meditate on them, but to adopt them, and translate them into action.

BICYCLE SAFETY

Autumn is here, and in many parts of our country, this is the most beautiful time of the year. The heat of the summer has given way to a temperature that invites one to take more exercise than usual, and it is easily understood that students have an intense desire to take bicycle trips out into the country. Everything is conducive to make these trips enjoyable. The air is just right, the foliage on bush and tree is changing to the most attractive colors, and the aroma exuding from earth and vegetation is most inviting.

The mode of conveyance — the bicycle — too, is enjoyable. It is speedy enough to satisfy the most exacting, gives the rider exhilarating exercise, and helps him travel greater distances in a given time than he could if he were walking. It is, therefore, a favorite with the average youngster.

Bicycle riding is surrounded with dangers, however. Warn your students that they should: live up to all rules of the road that are laid down for automobilists; use the same arm signals suggested for the drivers of automobiles; ride single file only; carry no passengers on the crossbar, handle bar, or fender; have their bicycles equipped with a serviceable headlight at the front, and a clean reflector at the rear; have their brakes properly adjusted; stay off the highways after dark if at all possible; refrain from hitching onto moving vehicles; and stay off the sidewalk with their bicycles.

UNUSUAL ACCIDENTS

Safety Research Institute, Inc., recently reported a plant accident where a group of men were told to do some work in the pit beneath a punch press. Their work required them to tap out a number of holes, and the lubricant used for this tapping operation was a nonflammable solvent which was new to the company. The solvent container bore the warning that ventilation should be provided wherever the solvent was used; hence, an air hose was arranged to direct some air into the pit in order to provide this ventilation.

The men worked all day without complaint, all but one stopping from time to time, "to come up for air." At the end of the day, two men became ill and one of them, the man who had worked with no interruption throughout the day, died a few days later.

Evidently the amount of ventilation was not sufficient for the quantity of solvent used in the confined space provided by the pit. In another plant, some men were given a new paint for use on machinery. They were unaware that the solvent in the paint was highly flammable, although the label warned that the material should be kept away from flames. The men applied the paint while a welding operation was going on near by, and, as might have been expected, a serious explosion followed.

If the label on an unfamiliar product carries warning statements which are not fully understood, detailed information on properties and necessary precautions to be observed should be obtained from the manufacturer before the product is put to use. Such information may also be available from the local city or state industrial hygiene division of the health or labor department.

Whether in plant or school shop, study the solvents, paints, coolants, and other products used, and run no chances with the lives of those whom you ask to work with them.

(Continued from page 357)

nickel chromium iron alloy which is both corrosion resistant and heat resistant; and a method of heating, either oil, gas, or electric. The choice of fuel, of course, is dependent upon locality; thus, gas would be used as the fuel where natural gas is available at a lower cost than either oil or electric, etc. In an installation such as those shown, it is imperative to have an accurate temperature measuring device to maintain the desired temperature.

The next consideration is the cyanide bath. See Figure 3.

The cyanide casehardening bath is one of the molten salt baths used in heat-treatment of steel. The semifinished or finished steel part to be hardened, is immersed into the liquid bath at a temperature over the critical range of the steel part treated for a definite period of time. During the immersion period, the carbon content of the surface is increased, and the depth of penetration and the concentration of carbon on the surface is directly dependent upon the time of immersion and the temperature. The hardness of the case is imparted to the steel when the part is water quenched after a proper cyanide immersion. The result is a combination of a hard surface and a soft interior producing an article of increased strength, toughness, and ductility, capable of withstanding both wear and abrasion.

The ordinary type of casehardening bath contains sodium cyanide (NaCNO as its principal constituent, which both has the unique advantage of supplying both the elements, nitrogen and carbon to the case). Nitrogen in the case increases the surface hardness to a marked degree and thus increases both wear and abrasion resistance of metal parts. This pickup of nitrogen in the case for the straight cyanide baths occurs under 1550–1600 deg. F., these operating temperatures being most common in use.

Sodium cyanide decomposes when melted in the presence of air, forming a sodium cyanate. This reaction, as illustrated in (1) occurs continually on the surface of the

Cautions in Handling Cyanide and First Aid Treatment

There is wide recognition of the need of caution in handling cyanide and products of which cyanide is a part, and veterans in its use generally understand the hazards and avoid them. However, the wider use of products containing cyanide in plants manned by newcomers in industry makes it advisable to review the precautions and the first aid treatment which may be necessary when precautions are neglected.

The Houghton products containing cyanide include the Perlitons, Perlitex of all grades, Bright Quenching Salts, Surface Hardening Powder, Liquid Heat Quench, and those Liquid Heat salts which are labeled for cyanide content. The precautions in handling such products can be expressed in ten common-sense rules:

1. Use scoop and dry cotton gloves.
2. Avoid contact with broken skin and open wounds.
3. Wash hands thoroughly after handling.
4. Keep the container covered when not in use.
5. Open the container only in the room or building in which the cyanide compound is used.
6. Keep cyanide free from the presence of acids. Cyanide in the presence of even the weakest acid will liberate the deadly gas HCN.
7. Food should not be stored, handled, or eaten in the vicinity of cyanide mixtures.
8. Wear rubber gloves when operating the bath or handling articles which have passed through it.
9. In case any irritation of the skin develops as a result of handling cyanide, consult a physician.
10. Burns from cyanide mixtures are treated as any burns caused by alkalies. Wash the area thoroughly with warm water to remove chemicals; then treat as any burn or consult a physician.

Operating the Salt Bath

While not to be considered as a complete manual, observance of the seven suggestions below will avoid the common dangers to personnel operating salt baths:

1. Do not mix a compound containing cyanide with one containing nitrates or nitrites, or put one in a container which has been used for the other. Violent reaction and possible explosions result from mixture of the two. Material treated in a bath of one group should not be processed in a bath of the other group until it has been thoroughly cleaned. (Houghton products containing nitrates or nitrites are the Draw Temps and Houghto-Black 15.)
2. Keep asbestos gloves always at hand.
3. Wear safety goggles or face mask when operating the bath.
4. Hoods and stacks are advisable for all salt baths.
5. All work must be thoroughly dry before introduction, or splattering may result.
6. When bailing out a bath, molten salt should not be stored in a mold or container of greater depth than six inches. The risk of serious eruption while solidifying increases with depth.
7. To avoid remelting hazards in all furnaces except those which heat from top down (as the internal electrode type), follow this procedure:

Before the bath freezes, insert a cast iron wedge with tip touching the bottom while the thick end projects at least four inches above the surface. The vent remaining when the wedge is removed from the solidified salt will permit escape of gases on remelting. Remove the wedge by tapping with a hammer, but not until the bath is completely solidified — if removed earlier, molten salt below the surface may erupt.

First Aid for Cyanide Poisoning

First aid is the emergency treatment to prevent further harm or possible death. It is applied immediately, prior to the arrival of physician. The first step is to obtain from a druggist and always have on hand for instant use:

Amyl nitrite pearls (heart stimulant).

Sodium thiosulfate 1 per cent solution (emetic; to induce vomiting, empty the stomach).

Call physician immediately; meanwhile apply first aid treatment promptly as follows:

If patient is *conscious* and *breathing:*

1. Break an amyl nitrite pearl in a piece of cotton gauze and hold lightly over nose while patient inhales.
2. If cyanide has been swallowed, induce vomiting by giving a pint of sodium thiosulfate 1 per cent solution. In the absence of sodium thiosulfate 1 per cent solution, give copious drafts of soapy water, mustard water, or bicarbonate of soda (2 teaspoons to pint of water). Continue the use of any of these emetics until return of clear solution proves stomach is empty.

If patient is *unconscious* but *breathing:*

1. Break an amyl nitrite pearl in a piece of cotton gauze and hold lightly over nose while patient inhales.
2. Follow with oxygen from inhalator.
3. Give nothing by mouth to *unconscious* patient.

If patient is *not breathing:*

1. Give artificial respiration at once, continuing until physician arrives.
2. While artificial respiration proceeds, an assistant breaks an amyl nitrite pearl in a piece of cotton gauze and holds to patient's nose.
3. Give nothing by mouth to *unconscious* patient.

— *Courtesy* E. F. Houghton & Co., Philadelphia, Chicago, Detroit, San Francisco.

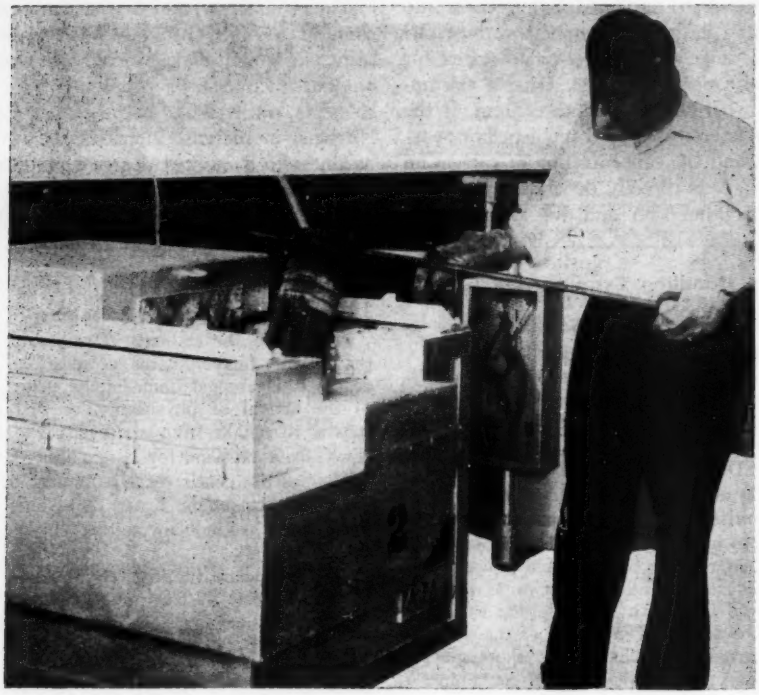


Fig. 3. The Cyanide bath
— Courtesy, E. I. du Pont de Nemours & Co., Inc., Wilmington, Dela.

bath as it comes in contact with the oxygen of the air.

(1) $2NaCN + O_2 = 2NaCNO$
Sodium cyanide + oxygen = Sodium cyanate

Sodium cyanate that is formed, is not stable, and is further decomposed at the casehardening temperatures, liberating both carbon monoxide and nitrogen. See reaction (2). It is these liberated ingredients, carbon monoxide and nitrogen, that are the active agents that react with the steel and form iron carbide (Fe_3C) and iron nitride (FeN). It is known that the nitrogen combines directly, while the carbon is probably converted into active carbon which combines with the iron to form cementite (reaction 3). The carbon dioxide liberated in reaction (3) forms again with sodium cyanide repeating the cycle just described. The rate of formation of cyanate and the rate at which free carbon is liberated at the metal surface determines the case hardening activity of the bath.

(2)	$4NaCNO$ — sodium — cyanate	Na_2CO_3 + sodium + carbonate	$2NaCN$ + sodium + cyanide	CO + carbons + monoxide	$2N$ active nitrogen
(3)	$2CO$ — carbon — monoxide	CO_2 + carbon + dioxide	C carbon		
(4)	$NaCN$ + sodium + cyanide	CO_2 — carbon — dioxide	$NaCNO$ + sodium + cyanate	CO carbon monoxide	

Factors Controlling Cyanide Hardening:

There are four factors which influence the case, namely: Time, operating temperature, composition of cyanide bath, type of steel treated.

The time may vary anywhere from 5 minutes to one hour, however, since the case depth does not increase proportionally to the time it is not economical to leave the parts in the usual cyanide bath longer than one hour. An accelerated bath, which will be mentioned later, is used where the time element is greater than one hour.

The operating temperature influences the activity of the bath and thus, indirectly controls the component elements, carbon and nitrogen, that enter the surface of the steel. Adequate temperature control should be provided so that the temperature is not allowed to fluctuate to any great extent. Uniform temperatures mean uniform work. A pyrometer, calibrated frequently either against a standard instrument or a metal or salt of known melting point, is used as a method for controlling temperatures. The thermocouple of the pyrometer should be protected by enclosing it in a nickel seamless tube, welded at the end.

The operating temperature for cyanide hardening varies from 1380–1625 deg. F., depending upon the upper critical point of the steel to be heat-treated. Casehardening proceeds most rapidly when the steel is heated above its upper critical temperature and the optimum physical properties are developed in the core when the metal is quenched from above this critical temperature. Figure 4 illustrates the structure and depth of case acquired at 1500, 1550, and 1600 deg. F. for varying times. The white portion is the case and it correspondingly increases with time and temperatures. Table 1 shows the carbon and nitrogen ingredients of a cyanide hardened steel.

In most cases, the straight cyanide baths have from 20 to 40 per cent sodium cyanide. It has been found by experience that baths over 40 per cent sodium cyanide do not operate efficiently and when the content becomes less than 20 per cent, too little carbon is released to give a deep case, although there are cases where a bath of this type is perfectly satisfactory. An example is a bath used for reheating. A typical bath analysis would be as follows:

Sodium cyanide	25–35 per cent
Sodium cyanate	2–5 per cent
Sodium chloride	0–25 per cent
Sodium carbonate	73–35 per cent

The first two ingredients are necessary components, the sodium chloride is relatively unimportant; however, it is desirable since it maintains fluidity and melting point of the bath. The sodium carbonate is inert and may be present under wide

Case composition of S.A.E. X1020 steel treated in a 30% NaCN bath as influenced by temperature. All bars treated 1 hour at the temperature indicated and air cooled. The composition of the case was determined by the analysis of a series of cuts each 0.004" on the radius.

Temperature	1500° F.		1550° F.		1600° F.	
NaCN %	30.6		30.95		30.75	
NaCNO %	7.87		4.88		3.80	
Cut No.	% C	% N	% C	% N	% C	% N
1	0.82	0.46	0.71	0.50	0.60	0.56
2	0.61	0.21	0.61	0.24	0.51	0.19
3	0.33	0.04	0.38	0.06	0.32	0.05
4	0.21	0.02	0.27	0.02	0.26	0.02
5	0.19	0.01	0.19	0.02	0.19	0.01
6	—	—	0.19	0.02	—	—

Table 1.
— Courtesy, E. I. du Pont de Nemours & Co., Inc., Wilmington, Dela.

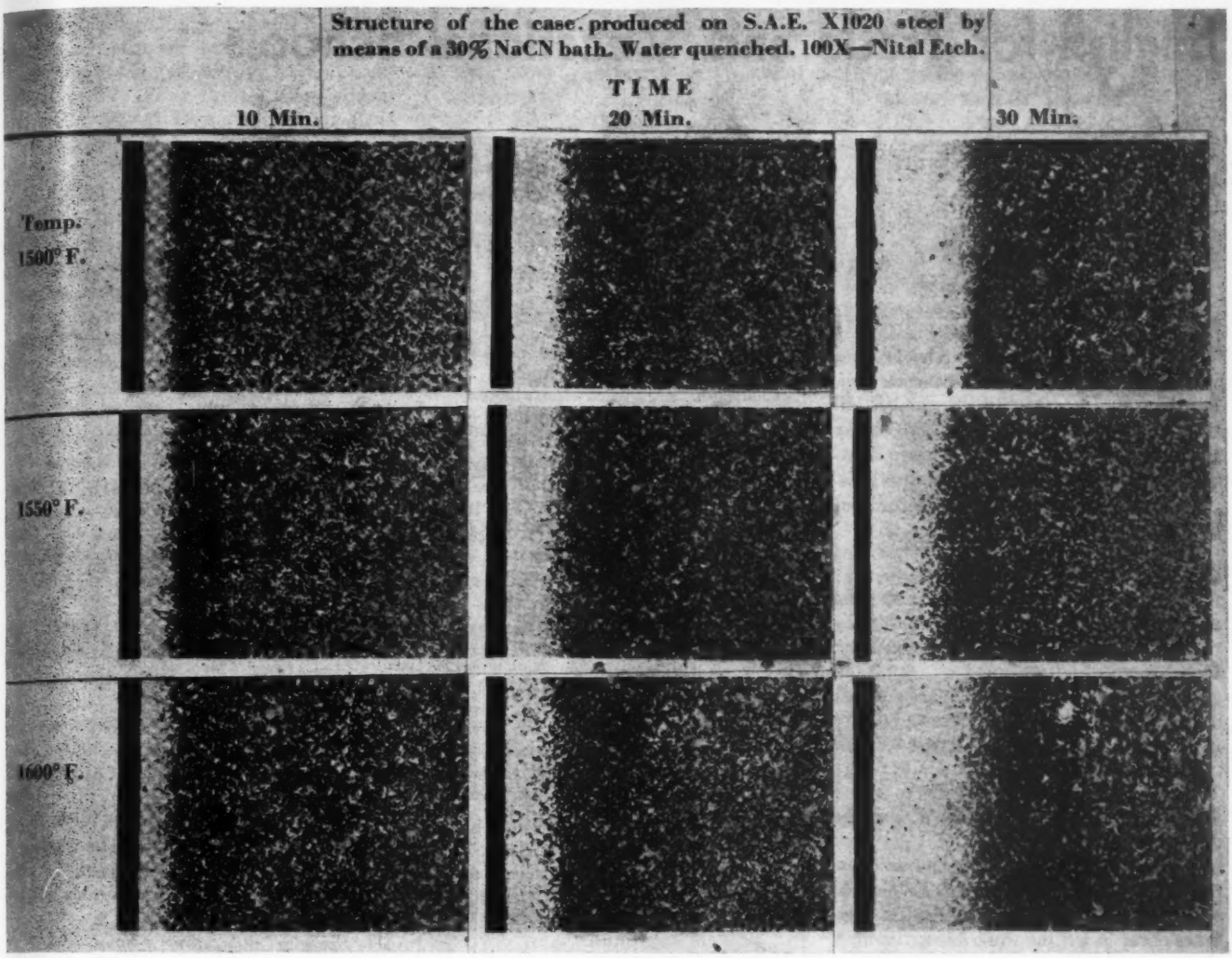


Fig. 4

— Courtesy, E. I. du Pont de Nemours & Co., Inc., Wilmington, Dela.

limits. Composition of the bath should be checked periodically by a chemist, and, in some cases, where intermittent work, but very critical work is performed, daily checks are necessary. Additions are made in accordance to the requirements as indicated by the chemical analysis, and the hardener has several compounds to choose as replenishers, each varying in sodium cyanide content.

It has been stated before that the rate of decomposition of sodium cyanide to sodium cyanate is directly proportional to the bath activity. At a given temperature, the greater the concentration of sodium cyanate, the greater is its rate of decomposition. This rate of decomposition increases as the temperature increases and thus both activity and speed of carburization also increases proportionally. This is shown in Figure 5. The commercial sodium cyanide mixture contains little, if any, sodium cyanate and it is for this reason, that a new cyanide bath must first age in order to obtain any casehardening activity. This aging consists of allowing the bath to idle at 1300 to 1450 deg. F. from 16 to 24 hours. At this temperature the decomposition of sodium cyanate is very slow, but its rate of formation is high by comparison.

Some use chemicals such as manganese dioxide (MnO_2) or an acid anhydride such as baron oxide (B_2O_3) to promote the formation of sodium cyanate. However, the use of chemical reagents is not recommended, but, if additions should be made, they are added very cautiously in very small amounts. Severe foaming and spattering may occur with possible overflow of the bath as the result of the violent reaction. Furthermore, too heavy an addition may decompose the cyanate formed in the bath which would defeat the purpose of the addition.

The low carbon and the low carbon alloy steels are used for carburizing purposes. Within these two classes, grain size and normality influences to a marked degree the behavior of the metal while casehardening. The fine grained steels, which property is predetermined and controlled at the mill are more difficult to caseharden than the coarse grain steels. The carbon concentration is higher and the gradation zone is narrower in the fine grain steels than the coarse grain steels. This further depth of carbon penetration on the coarse grain steel promotes greater toughness and low distortion tendencies of fine grained steels.

The structural conditions of the steel also influence the behavior of the steel to the casehardening and hardening processes. The steels exhibiting an abnormal structure should be avoided because of the difficulty involved in obtaining uniform hardening.

(To be continued)

English for Trade and Vocational Schools

J. ALLEN MORRIS
Murray Vocational School
Charleston, S. C.

Uses of the Apostrophe

(Part II continued from page 268 of the September, 1948, issue)

On leaving the elementary schools, most vocational school students seem to have heard of the uses of the apostrophe, but their written work is not much affected by their previous instruction. They are, however, ready to learn the uses of the apostrophe if the instruction can be spread out over a period of several years.

Most boys can quickly learn the idea of using an apostrophe and the letter "s" to show singular ownership. After receiving a little assistance with contractions, they understand and can use them correctly. Plural forms of letters, numbers, signs, and symbols are seldom used and cause almost no trouble. The students' greatest difficulty is encountered when they attempt to show plural ownership.

In my classes I do not attempt to secure mastery of all the uses of the apostrophe until the senior year. By this time each boy knows everything except how to show plural ownership, and this can be quickly explained and eventually mastered. As mistakes occur in written work during the first three years of our four-year course, I correct, teach, and explain, working individually with each student. Almost the same results can be secured in a school using standard classroom methods by teaching singular ownership in the first year, contractions in the second, plurals of letters, numbers, signs, and symbols in the third, and plural ownership in the fourth. I use several drill sheets to test each boy's knowledge and to give him practice in using the forms often enough to make their correct use habitual. Completion of the third drill sheet usually secures the desired result.

The three drill sheets, together with a deliberately repetitious explanation sheet, are reproduced here for use in other schools:

Drill Sheets:

Uses of Apostrophe (I)

I. *Singular ownership:*

a) Write the following sentences, adding *'s* to the nouns that show ownership:

1) Israel Hands was Flint gunner. (2) The doctor side won the fight. (3) The parrot voice frightened Jim. (4) A sheriff duties are numerous. (5) The judge orders were carried out. (6) Jim plans failed. (7) The ship boat was smashed on the beach. (8) It looks like a death head. (9) My uncle house is out in the country. (10) Silver life was spared because he had helped Jim.

b) Write ten sentences, using any ten of the following groups of words:

driver's license	a week's pay
Germany's army	a day's work
the girl's skates	lion's paw
Tom's chisel	a month's leave
a woman's hat	machinist's calipers
the plane's blade	machine's gears

II. *Plural ownership:*

a) Write the following sentences, adding an apostrophe to the nouns that show ownership:

1) The boxes covers were burned. (2) The knives blades were dull. (3) The monkeys cages were large. (4) The heroes medals were presented. (5) The boys cars were stolen.

b) In the following sentences the nouns that show ownership are plural but do not end in *s*. Add *'s* to each:

1) Many men lives were lost. (2) The children toys were repaired. (3) The women speeches were short. (4) The draftsmen instruments rusted. (5) The policemen clubs were stolen.

III. *Singular and plural ownership:*

Write the following sentences, adding *'s* or *'* to the nouns that show ownership:

1) He heard the tapping of the beggar stick. (2) The heavy weight crushed the man chest. (3) He could not pay for his children education. (4) The men hats were spoiled by the rain. (5) Five boys bicycles were stolen.

Uses of Apostrophe (II)

I. Write the correct forms of the following contractions — *and their meanings:*

aren t	I d	we re
who s	didn t	shouldn t
that s	let s	doesn t
can t	we ll	what s
they ll	they re	they ve
haven t	we d	you ll
where s	wasn t	wouldn t
I ll	it s	
won t	you ve	

II. Write the plural forms of the following letters, figures, and signs:

m — ? — 7 — k — ! — 3 — 4

Use apostrophes in the following sentences:

Explanation Sheet: Uses of Apostrophe

I. *To show ownership:*

a) The apostrophe (') is used to show ownership (possession).

The usual rule is to add an apostrophe and *s* to any *singular noun:*

Singular nouns:	*Singular ownership:*
John	John's bicycle
Charleston	Charleston's hotels
boy	boy's sailboat
mechanic	mechanic's tools

b) If the noun is *plural*, just add an apostrophe:

Plural nouns:	*Plural ownership:*
boys	boys' sailboats
girls	girls' hats
mechanics	mechanics' tools

c) Some nouns are plural but do not end in *–s*. These nouns are treated as if they were singular: add *'s* to each:

men	men's jobs
women	women's speeches
children	children's toys
draftsmen	draftsmen's instruments

Generally (but not always) a noun ending in *'s* is singular.

Usually (but not always) a noun ending in *s'* is plural.

These rules can be simplified so that they are easy to use:

If the word ends in the letter *s*, just add the apostrophe:

boys–boys' — mechanics–mechanics' — girls–girls'

If, however, the word does not end in *s*, add *'s:*

boy–boy's girl–girl's
men–men's women–women's

mechanic–mechanic's
draftsmen–draftsmen's

II. *To form contractions:*

A contraction is a shortened form made up of two words linked together, with one or more letters left out.

Examples of contractions:

it's: it is	aren't: are not
let's: let us	weren't: were not
who's: who is	they're: they are
I've: I have	can't: can not

III. *To form plurals of letters, numbers, signs, and symbols:*

Examples:

3's a's ?'s !'s –'s

1) His n s look like m s. (2) He makes too many mistakes by writing e s that look like 3 s. (3) Dot your i s and cross your t s. (4) There are too many 4 s in your answer. (5) How many s s are there in "Mississippi"?

III. Copy the following sentences on your paper and punctuate them:

1) John s father is out of work again. (2) That boy s fun is spoiled by his mother s mean temper. (3) The doctor s advice helped him to get well. (4) Tom s home run won the game. (5) The girl s exhibit won a prize in the fair. (6) The men s tools were stolen from the shop. (7) The children s toys were repainted. (8) The women s arguments disturbed the neighborhood. (9) The girls lunches were ruined by the rain. (10) The boys boats sank during the storm.

IV. Copy and punctuate the following sentences:

1) John s car is a Ford. (2) There are three 3 s in his license. (3) Pronounce the g s in "swimming" and "running." (4) I won t go unless I m invited. (5) Boys coats and girls sweaters are made of wool.

V. On your paper write the *singular possessive* form and the *plural possessive* form of each of the following words:

book	desk	battery
man	child	pulley
boy	lady	truck
dog	woman	machine
file	school	pencil
girl	chisel	automobile
boat	hammer	

Uses of Apostrophe (III)

I. Copy these sentences on another sheet of paper and punctuate them:

a) (1) the steamer s dead-weight capacity is 6,410 tons (2) his father s brother is my friend s boss (3) these figure s are a considerable increase over last year s quotations (4) send your application to the president s secretary (5) his uncle is chief clerk of the coroner s office.

b) (1) his name is spelled with two m s and two i s (2) he usually forgets to dot his i s and cross his t s (3) she writes 7 s and 3 s backward (4) make your z s different from your x s (5) some people roll their r s and drop their g s.

c) (1) some people don t work hard enough to keep their jobs (2) his mother told him that he couldn t go swimming, but he wouldn t obey her. (3) he can t go to the camp because his father won t let him (4) they haven t sense enough to know that they can t break the city s laws and get away without being caught (5) Jack doesn t understand mathematics, and so he will never graduate from high school.

II. Copy and punctuate the following sentences:

a) (1) he is the presiding officer of the democratic men s club (2) the name of the newsboys club has been changed recently (3) the inspectors report cost the company thousands of dollars (4) the men s tools were stolen (5) the delegation passed a bill raising teachers salaries (6) he asked for a few months time to finish the work (7) this year s crop will not bring in much money (8) in today s mail you will receive a copy of our company s latest catalogue (9) give us a few days notice before you begin the work (10) your suggestion will be considered at the next directors meeting.

b) (1) he learned how to write the letters of the alphabet, but he has trouble with q s, z s, and j s (2) one man counted by 2 s and the other by 3 s (3) the teacher asked the class, "How many 0 s are there in a million?" (4) in solving algebraic equations, one must watch the + s and — s (5) it is wrong to put two t s in "writing" and two m s in "coming"

c) (1) its too late to start now (2) lets go home (3) you havent seen him because he isnt here now (4) thats all that were going to do today (5) we havent time to finish the job.

III. Study the examples carefully; then do the same with the following:

Examples:

Given: "the heads of the horses," you write "horses' heads."

Given: "the signals of the men," you write "men's signals."

Given:

1. the caps of the boys
2. the wings of the birds
3. the hour of the children
4. the tools of the carpenters
5. the war dance of the Indians
6. the fur of the foxes
7. the speeches of the politicians
8. the marks of the students
9. the gloves of the ladies
10. the jokes of his brothers
11. the profits of the companies
12. the sentences of the judges
13. the losses of the nations
14. the hoofs of the ponies
15. the badges of the policemen
16. the guns of the gangsters
17. the names of the women
18. the whistles of the factories
19. the jobs of the workmen
20. the songs of the seamen

(To be continued)

Methods of Teaching Occupational Subjects

C. A. FELKER
Department of Vocational Education
Toledo, Ohio

(Continued from page 314 of the October, 1948, issue)

The Presentation Step

As mentioned heretofore, the purpose of the preparation step is to gain the attention and arouse the interest of the students. In other words, the shop instructor uses the preparation step to set the stage for the presentation.

During the latter step, he tells and shows the students how to do the job or operation. This is called the demonstration method of putting over the presentation step, and it is the only method that the shop instructor should employ in teaching a manipulative lesson.

To make telling and showing more effective; that is, to make the demonstration more effective, the shop instructor should ask questions. In teaching a shop lesson, the instructor should use the developmental line of approach in the presentation. To use the developmental line of approach, the shop instructor and the class, together, develop *some* of the manipulative steps in the presentation. This may tend to slow up the lesson during the presentation step, but, it is an effective device to maintain student interest. Furthermore, as a device, it helps the student to a fuller understanding of the correct method of doing the job or operation. Then, too, the shop instructor senses whether or not the class is absorbing the details involved in the job or operation.

This latter point is important because the shop instructor can shift the emphasis to meet the problem. Perhaps he will perform the manipulative steps more slowly; perhaps he will put more emphasis upon questions; or, perhaps he will require the students to think out for themselves the subsequent manipulative steps.

All this takes the presentation step out of the realm of entertainment and puts it on a firm basis, which assumes that the students, as well as the instructor, are putting hard, sober thought upon everything that goes on in the presentation step.

Too often, in shop lessons, the instructor may fail to use questions in the presentation step, which means that he is not using the developmental line of approach. He is telling and showing; that is, he is using the demonstration method. But this is not enough. ***The skillful use of questions of the right kind is indispensable in the presentation step.***

The skillful use of questions of the right kind is not acquired by a shop instructor without conscious effort. To use questions effectively in the presentation step requires *practice, practice, and still more practice.* Every shop instructor should develop his ability to use questions effectively in the presentation step. Such questions can be either direct or overhead, depending upon the instructor's ability to maintain discipline; and they should be either thought or suggestive questions, depending upon the point to be put across.

In putting over the presentation step, the shop instructor should follow the job analysis from the "machine-shop textbook." This job analysis shows the lesson on plain drilling flat work (series of holes same size). The lesson is in the vertical drill press block (sometimes called the upright drill press block). We can avoid confusion at this point if we say that our lesson title — plain drilling flat work (series of holes same size) — is found in the machine-shop textbook, in Chapter IX entitled Vertical Drill Press.

Table showing columns two and three from the machine-shop job analysis set up to form the blueprint of the presentation step: (See table in center column).

Operation Steps	*Information Points*
a) Mounted on table	
1. Clamp work on parallels.	1. Sleeves, rings, neckties. 1. Clamp securely.
2. Center punch all layout centers.	2. Check layout. 2. Center punch each hole to start drill.
3. Insert drill.	3. Check drill size.
4. Set speed and feed.	4. Drill speed: $\frac{4S}{D}$ = r.p.m.
5. Unlock table and position approximately.	5. Use care in pulling over table.
6. Start machine.	
7. Advance drill by hand, take trial cut.	7. Depth of trial cut.
8. Pull over table if necessary.	8. Recenter punch.
9. Lock table, lock feed.	
10. Drill through work.	10. Do not drill into table.
11. Repeat steps 5, 7, 8, 9, 10, for remaining holes.	

In the analysis of this lesson, we use columns two and three to put across the presentation step, column two containing the operation steps which the shop instructor performs, and column three, the information points which the shop instructor must put across while demonstrating the operation steps in column two. In other words, *columns two and three form the blueprint of the presentation step.* These columns show what the shop instructor is going to teach in the presentation step of the lesson on plain drilling flat work (series of holes same size).

The items in these two columns are highly abbreviated. There is no advantage in stretching out the items in columns two and three. The items are clear to any shop instructor and that is sufficient. This job analysis is not for student use as it stands although it forms the basis for the development of operation sheets *which are instruments for student use.*

It should be noted that in the blueprint of the presentation step shown, the information points bear the *same numbers* as the operation steps to which they apply. This means that they must be taught in the presentation step at the time the operation step is taught. For example, the first item in the column headed "operation steps" is *clamp work on parallels.* Now, column two shows that there are *two* information points which must be taught with item one in column one. These two information points can be taught either *before* the instructor clamps the work, *while* he clamps the work, or *after* he clamps the work on the parallels.

Many shop instructors insist that the safety precautions regarding flowing sleeves, rings, and neckties should be observed before work is started; consequently, this information point should be taught *before* the instructor clamps the work on the parallels. Information point number one; namely, clamp parallels securely, should, beyond a doubt, be taught immediately *after* the shop instructor clamps the work on the parallels.

There are, perhaps, several ways in which the shop instructor can begin the presentation step of this lesson. First, he should remember that he must *tell, show, and ask questions.* Let us repeat to avoid any misunderstanding at this point. Telling and showing mean that the shop instructor is using the *demonstration method* of putting over the presentation step. This is the correct method and the only method to use in the presentation step of a shop lesson involving manipulations. The skillful use of the right kind of questions means that the shop instructor is using the *developmental line of approach.* This is the correct approach and the only approach to use in the presentation step of a shop lesson involving manipulations. After bearing in mind the foregoing, the shop instructor can begin the presentation in the following manner:

Plain drilling involves the use of a rotating cutting tool called a drill. When we operate a machine in which either the cutting tool or the work revolves, we should observe several safety precautions before we begin the work. "What are the safety precautions that we must observe before we operate a machine in which the cutting tool revolves, John?" *Answer:* "Roll up flowing sleeves — remove rings from fingers — remove neckties."

"Now, we will perform the first step in the operation — plain drilling flat work (series of holes same size)." The shop instructor then clamps the work on the parallels and asks a *direct thought question.* "Why is it necessary to clamp the work securely, James?" *Answer:* "To prevent it from breaking loose." Then, the instructor proceeds to step number two.

To put across the first operation step, the shop instructor must show how the work is clamped on the parallels, and, during the showing, he will also do some telling. In addition, as noted in the foregoing, he asks questions to develop the lesson. The first question is suggestive and the second, thought. Now, the instructor could tell the class these two information points and save time in the presentation step, but telling is not the most affective way of putting over the presentation step. Telling, showing, and questioning are effective because the students must do some thinking during the presentation step. The two questions, used above, are significant. They illustrate what we mean by the developmental line of approach. As can be noted, we have really developed these two information points.

We should not infer from the foregoing that questions are only used to develop the information points in the presentation step. They can also be used to develop some of the operation steps. For example, after the instructor completes operation step number five, he might use a suggestive

question to get an answer for operation step number six. For example, the instructor, after completing step number five, can say, "Now we have completed all the preliminaries and we are ready to go. What is the next thing to do, George?" *Answer:* "Start the machine."

By the skillful use of the right kind of questions, the instructor is employing a powerful tool whose sole purpose is to stimulate student thinking during the presentation step. This shop lesson is typical of all shop lessons. Each operation step is to be performed in a certain way and the shop instructor shows the correct way to do it. Later in the lesson the members of the class each perform the operation and they should perform it in the same manner that the shop instructor taught it in the presentation step. In other words, *the performance of the student is not graded on the end result only.* He may drill a perfect hole, but he may not follow the techniques and methods put over in the presentation step. Again, he may drill a satisfactory hole, but he does not remove his necktie. This necktie may dangle around the revolving drill, and even though he drills a perfect hole, he does not perform the operation as it was presented to him. This illustrates the necessity for skillful questioning. When the student performs later in the lesson, he should perform everything exactly as he was taught in the presentation step. If the students have to think out some of the things in the presentation step during the presentation, they will be more likely to remember them when they are called upon to perform the operation.

At this point a precaution to the shop instructor is in order. In the performance of many machine operations, there are various methods of performing the same operations. Such methods will be *alternate methods.* If, during the presentation, the instructor recalls an alternate method, *he should not branch off from the method being used to present the alternate method.* This confuses the student. It results in a lesson far too long for best results. It results in a lot of extra reteaching and supervision later, when the student performs the operation in the application step.

(To be continued)

Teaching Materials For Industrial Education

CHRIS H. GRONEMAN
Industrial Education Department
Agricultural and Mechanical College of Texas
College Station, Tex.

(Continued from page 272 of the September, 1948, issue; for complete directions when ordering films refer to page 270 in September issue)

Films — Metal, concluded

Excursions in Science, No. 5 — 16mm. — sound — 1 reel — 50 cents (rental)
Excursions in Science, No. 6 — 16mm. — sound — 1 reel — 50 cents (rental)
Facing, Turning, Boring, Grooving, Champfering on a Vertical Turret Lathe Using Two Heads — 16mm. — sound — 3 reels — $3 (rental)
Fitting and Scraping Small Bearings — 16-mm. — sound — 2 reels — $2 (rental)
Fixed Gages — 16mm. — sound — 2 reels — $2 (rental)
Fundamentals of End Cutting Tools — 16-mm. — sound — 1 reel — $1.50 (rental)
Fundamentals of Filing — 16mm. — sound — 1 reel — $1.50 (rental)
Fundamentals of Side Cutting Tools — 16-mm. — sound — 1 reel — $1.50 (rental)
Height Gages and Standard Indicators — 16mm. — sound — 2 reels — $1.50 — (rental)
How to Machine Aluminum — 16mm. — sound — 3 reels — 50 cents (rental)
How to Rivet Aluminum — 16mm. — sound — 2 reels — 50 cents (rental)
How to Weld Aluminum — 16mm. — sound — 3 reels — 50 cents (rental)
Industrial Revolution — 16mm. — sound — 1 reel — $1.50 (rental)
Laying Out Small Castings — 16mm. — sound — 2 reels — $2 (rental)
Excursions in Science (Magnetism) No. 1 — 16mm. — sound — 1 reel — 50 cents (rental)
Magnesium-Metal from the Sea — 16mm. — sound — 2 reels — 50 cents (rental)
Lead Milling, Smelting and Refining — 16-mm. — sound — 3 reels — 50 cents (rental)
Lead Mining in Southeast Missouri — 16mm. — sound — 3 reels — 50 cents (rental)
Looking into Metals (Telephone) — 16mm. — sound — 1 reel — 50 cents (rental)
Machine Maker — 16mm. — sound — 1 reel — $1.50 (rental)
Machining Rectangular Cast Iron Block — 16mm. — sound — 3 reels — $2.50 (rental)
Machining a Tool Steel V Block — 16mm. — sound — 2 reels — $2 (rental)
Manufactured Abrasives — 16mm. — sound — 2 reels — 50 cents (rental)
Men and Machines — 16mm. — sound — 1 reel — 50 cents (rental)
Metalcraft — 16mm. — sound — 1 reel — $1.50 (rental)
Micrometer — 16mm. — sound — 2 reels — $1.50 (rental)
Milling Machine — 16mm. — ½ reel — $1 (rental)
Nickel Highlights — 16mm. — sound — 3 reels — 50 cents (rental)
Nickel Milling and Smelting — 16mm. — sound — 2 reels — 50 cents (rental)
Nickel Mining — 16mm. — sound — 2 reels — 50 cents (rental)
Nickel Refining — 16mm. — sound — 1 reel — 50 cents (rental)
Reaming with Straight Hand Reamers — 16mm. — sound — 2 reels — $1.50 (rental)
Reaming with Taper Hand Reamers — 16-mm. — sound — 1 reel — $1.50 (rental)
Rough Facing, Boring and Turning a Shoulder on a Vertical Turret Lathe — 16mm. — sound — 2 reels — $2 (rental)
Rough Facing, Turning and Drilling on a Vertical Turret Lathe — 16mm. — sound — 3 reels — $3 (rental)
Rough Turning Between Centers — 16mm. — sound — 2 reels — $1.50 (rental)
Royal Mint (Gold) — 16mm. — sound — 1 reel — 50 cents (rental)
Simple Machines — 16mm. — sound — 1 reel — $1.50 (rental)
Stainless Steel — 16mm. — sound — 3 reels 50 cents (rental)
Steel — 16mm. — sound — 1 reel — $1.50 (rental)
Steel Rule — 16mm. — sound — 2 reels — $1.50 (rental)
Story of Arc Welding — 16mm. — sound — 3 reels — 50 cents (rental)
Story of Copper — 16mm. — sound — 3 reels — 50 cents (rental)
Straddle and Surface Milling to Close Tolerances — 16mm. — sound — 3 reels — $2.50 (rental)
Straddle Milling — 16mm. — sound — 2 reels — $1.50 (rental)

Bulletin: *Announcement of Visual Aids; Motion Pictures and Glass Slides.* All subjects, silent or sound.

South Bend Lathe Works, South Bend 22, Ind.

The Lathe — 20 min. — 16mm. — sound — color
Plain Turning — 20 min. — 16mm. — sound — color

United States Department of the Interior, Bureau of Mines, 4800 Forbes St., Pittsburgh 13, Pa.

Manufactured Abrasives — 16mm. — silent — 2 reels — 15 min.

Modern Metalworking with the Oxy-acetylene Flame — 15 min. — 16 or 35mm. — silent — 2 reels
Aluminum — Mine to Metal — 15 min. — 16 or 35mm. — silent — 2 reels
Aluminum — Fabricating Processes — 15 min. — 16 or 35mm. — silent — 2 reels
Copper Mining in Arizona — 15 min. — 16 or 35mm. — silent — 3 reels
Copper Leaching and Concentration — 15 min. — 16 or 35mm. — silent — 1 reel
Copper Smelting — 16 or 35mm. — silent — 1 reel
Copper Refining — 16 or 35mm. — silent — 1 reel
Fabrication of Copper — 16 or 35mm. — silent — 3 reels
The Making and Shaping of Steel-Raw Materials — 16mm. — silent — 1 reel
The Making and Shaping of Steel — Making the Steel — 16mm. — silent — 1 reel
The Making and Shaping of Steel — Flat Rolled Products — 16mm. — silent — 1 reel
The Making and Shaping of Steel-Bars — 16mm. — silent — 1 reel
The Making and Shaping of Steel-Rails and Axles — 16mm. — silent — 1 reel
The Making and Shaping of Steel-Wire and Wire Products — 16mm. — silent — 1 reel
The Making and Shaping of Steel-Pipe and Tube Manufacture — 16mm. — silent — 1 reel
Alloy Steel — A Story of their Development — 20 min. — 16 or 35mm. — sound
Arizona — Its Mineral Resources and Scenic Wonders — 40 min. — 16mm. — sound
Nickel Mining — 16 min. — 16mm. — sound
Nickel Milling and Smelting — 17 min. — 16mm. — sound
Nickel Refining — 10 min. — 16mm. — sound
Lead Mining in Southeast Missouri — 33 min. — 16mm. — sound
Lead Milling, Smelting and Refining — 34 min. — 16mm. — sound
How to Machine Aluminum — 32 min. — 16mm. — sound
How to Rivet Aluminum — 27 min. — 16mm. — sound
Stainless Steel — 29 min. — 16mm. — sound
Nickel and Nickel Alloys — 32 min. — 16mm. — sound
How to Form Aluminum — General Sheet Metal Practice — 21 min. — 16mm. — sound
How to Form Aluminum — Blanking and Piercing — 16 min. — 16mm. — sound
How to Form Aluminum — Tube and Shape Bending — 14 min. — 16mm. — sound
How to Form Aluminum — Drawing, Stretching and Stamping — 22 min. — 16mm. — sound
How to Form Aluminum — Spinning — 17 min. — 16mm. — sound
Magnesium — Metal from the Sea — 23 min. — 16mm. — sound
Airplanes — Their Metals, Fuels and Lubricants — 37 min. — 16mm. — sound
A Story of Copper — 34 min. — 16mm. — sound
Tin from Bolivia — 20 min. — 16mm. — sound

United States Steel Corp. of Delaware, 436 Seventh Ave., Pittsburgh 30, Pa.
Steel — Man's Servant — 38 min. — 16 and 35mm. — sound — color
The Making and Shaping of Steel — 77 min. — 16 and 35mm. — sound; 105 min. — 16mm. — silent
Behind the Annual Report — 15 min. — 16 and 35mm. — sound
Bridging San Francisco Bay — 20 min. — 16mm. — sound
Lake Carrier — 11 min. — 16mm. — sound
U.S.S. Cor-Ten — 20 min. — 16 and 35mm. — sound
Help Yourself Beat the Heat — 12 min. — 16mm. — sound — color

(*To be continued*)

Problems and Projects

HACK-SAW FRAME

PAUL L. JENNINGS
Metal Shop Instructor
Benjamin Bosse High School
Evansville, Ind.

The hack-saw frame described in this article was designed and developed in the metal shop of the Benjamin Bosse High School, Evansville, Ind. It created and still creates a great deal of interest and appeals to the advanced machine-shop student. This project enables the student to make something that will be of value to him in his home.

Hack-saw frame

Handle

Material: 1 by 4½-in. cold rolled steel

1. Select material and cut to the required size.
2. Center drill both ends and place in lathe between centers.
3. Turn down to ⅞-in. diameter and shape handle.
4. Lay out medium knurled portion of handle.
5. Drill ½-in. diameter hole 3 7/16 in. deep to make the handle lighter.
6. ⅝-in. ream for press fit in end of handle ½ in. deep for plug.
7. Use drill size No. F for 5/16 — 18–N.C. thread in the opposite end of handle.
8. Tap hole with 5/16 — 18–N.C. thread.

Plug

Material: 1 by 1-in. cold rolled steel

1. Select material and cut to the required size.
2. Mount in chuck and shape one end.
3. Reverse ends and shape other end.
4. Cut to required diameter for a press fit.
5. Press in handle.
6. Shape end of handle.
7. Polish handle.

Arm Holder

Material: ⅝ by 1 by 2⅛-in. cold rolled steel

1. Select material and cut to the required size.
2. File square.
3. Round corners.
4. Locate and drill 5/16-in. diameter hole ½ in. deep for upper arm.
5. Locate and drill 21/64-in. diameter hole through piece for lower arm.
6. Cut slot 3/32 in. wide and ⅜ in. from center of hole with metal cutting coping saw and file for pin in the lower arm.
7. Polish.

Upper Arm

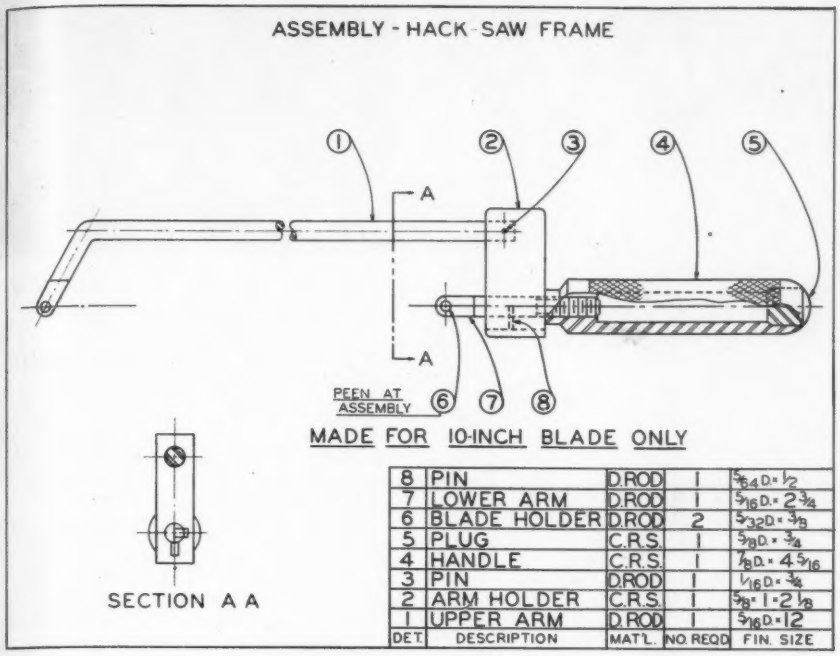
Material: 5/16-in. diameter by 12-in. drill rod

1. Select material and cut to required length.
2. Bend one end 1¾ in. from end at 30-deg. angle. Cut down 5/32 in., ⅝ in. from end for hack-saw blade.
3. Round angle end 5/32-in. radius for safety and design.
4. Drill ⅛-in. hole for pin 7/32 in. from end and countersink hole slightly on back side.

Lower Arm

Material: 5/16-in. diameter by 2¾-in. drill rod

1. Select material and cut to required length.



DET.	DESCRIPTION	MAT'L.	NO. REQD	FIN. SIZE
8	PIN	D.ROD	1	5/64 D × 1/2
7	LOWER ARM	D.ROD	1	5/16 D × 2 3/4
6	BLADE HOLDER	D.ROD	2	5/32 D × 3/8
5	PLUG	C.R.S.	1	5/8 D × 3/4
4	HANDLE	C.R.S.	1	7/8 D × 4 5/16
3	PIN	D.ROD	1	1/16 D × 3/4
2	ARM HOLDER	C.R.S.	1	5/8 × 1 × 2 1/8
1	UPPER ARM	D.ROD	1	5/16 D × 12

Assembly of hack-saw frame

2. Cut down 5/32 in., 5/8 in. from end for hack-saw blade.

3. Thread opposite end with 5/16 — 18–N.C., 1 in. from end.

4. Drill 1/16-in. diameter hole for pin 1½ in. from threaded end parallel with the cut for the hack-saw blade. Cut ½ in. from 5/64-in. diameter drill rod, form and force into 1/16-in. diameter hole to hold lower arm straight.

5. Drill ⅛-in. hole for blade holder 3/16 in. from slotted end and countersink hole slightly on back side.

Blade Holder

Material: 5/32-in. diameter by ⅜-in. drill rod — 2 required

1. Select material and cut to required length.

2. Turn shoulder in lathe to fit ⅛-in. hole 5/32 in. from end.

3. Place one blade holder in upper arm and peen into countersunk part and polish.

4. Place one blade holder in lower arm and peen into countersunk part and polish.

Assembly

1. Assemble upper arm into arm holder.

2. Drill 1/16-in. hole through arm holder and upper arm.

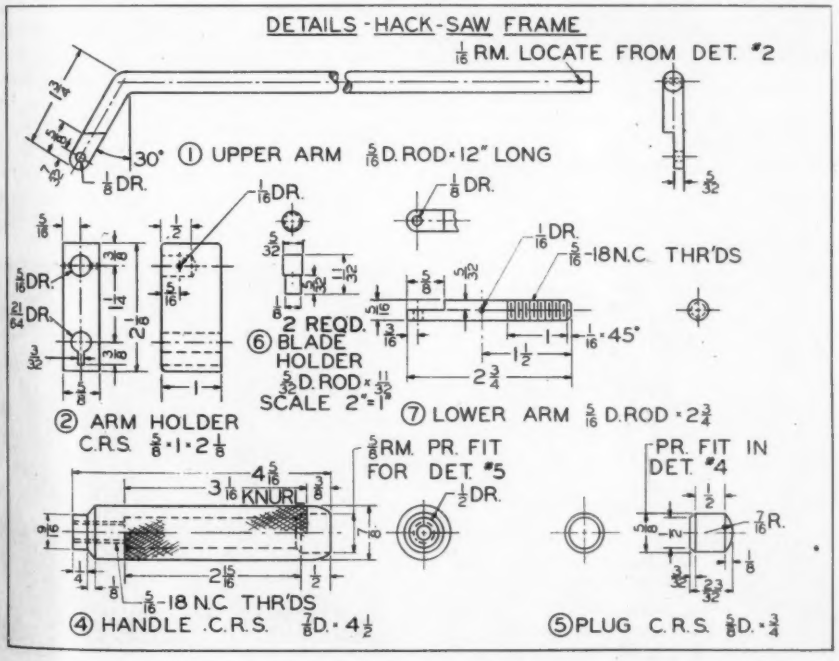
3. Countersink hole slightly on both sides of arm holder.

4. Cut ¾-in. from 1/16 drill rod and place pin in arm holder through upper arm. Peen both sides into countersunk part. File and polish.

5. Place lower arm into arm holder and screw into handle.

6. Insert a new hack-saw blade.

7. Submit to instructor for inspection.


DETAILS - HACK-SAW FRAME
1/16 RM. LOCATE FROM DET. #2
30°
① UPPER ARM 5/16 D. ROD × 12" LONG
1/8 DR.
1/16 DR.
1/8 DR.
1/16 DR.
5/16-18 N.C. THR'DS
⑥ BLADE HOLDER 5/32 D. ROD × 11/32
2 REQD.
SCALE 2" = 1"
⑦ LOWER ARM 5/16 D. ROD × 2 3/4
② ARM HOLDER C.R.S. 5/8 × 1 × 2 1/8
3 1/16 KNURL
5/8 RM. PR. FIT FOR DET. #5
1/2 DR.
5/16-18 N.C. THR'DS
④ HANDLE C.R.S. 7/8 D. × 4 1/2
PR. FIT IN DET. #4
7/16 R.
⑤ PLUG C.R.S. 5/8 D. × 3/4

Details of hack-saw frame

THE GLUE CORNER

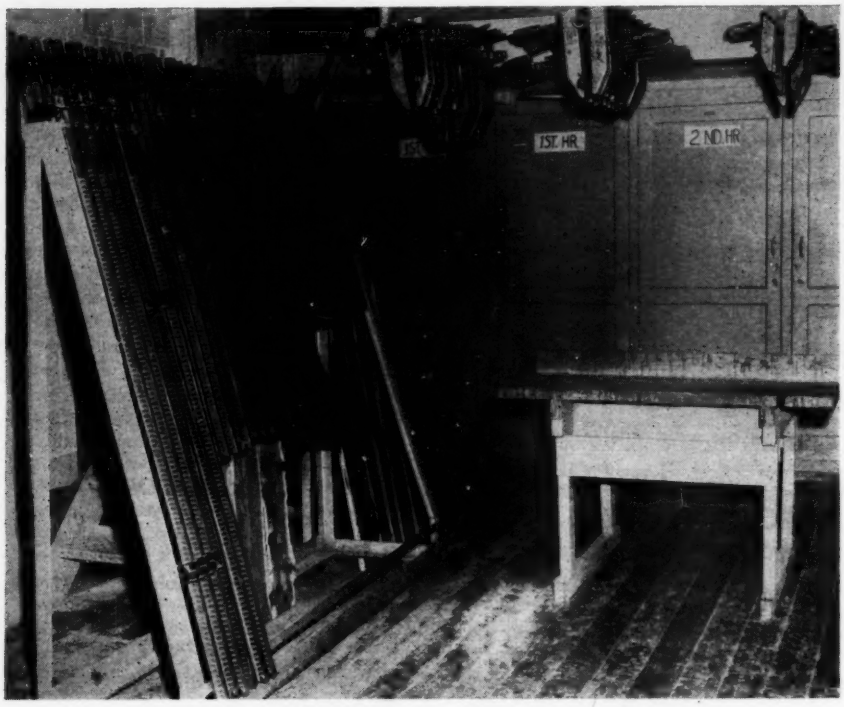
H. A. ALLENDER
Instructor of Woodwork
Will Rogers High School
Tulsa, Okla.

The gluing facilities present quite a number of problems in the woodshop. The illustration on page 368 shows how the writer is attempting to meet some of these problems.

The table upon which to do most of the glue jobs is an old discarded double workbench. Fitted into the trough of the bench is a 2 by 4-in. piece of oak mounted on edge with screws through the top of the bench. This oak piece is for holding the clamps when clamping stock. It has notches cut into it just wide and deep enough to accommodate the bar of the clamps. This device holds the clamps on edge when applying clamps on stock to be glued. Use of this table confines the gluing to one table and also one area near the gluepot and clamp racks. This prevents the spreading of glue to other portions of the shop.

Then there is the rack for the bar clamps shown in the illustration. To keep the clamps where they are to be used and in a systematic order, a sturdy rack is essential. The rack shown was made in the high school welding shop of 2 and 3-in. angle iron. The design was furnished by the writer. It is 20 in. wide at the bottom, 60 in. high at the back, and is 66 in. long. The top member of the rack at the front has slots cut into it, into which the bar of each clamp fits (jaws to back) when clamps are on the rack. The rack holds 33 bar clamps varying in length from 24 to 60 in. in length. It is mounted on casters to facilitate moving.

The racks provided for the hand screw clamps were made by welding a 1 by 30-in. piece of gas pipe onto a piece of boiler plate and then bolting the boiler plate to an exposed channel iron which is a part of the structural steel framework which supports an overhead deck in the shop. They could have been mounted on a wall instead. Three such racks are necessary to accommodate the hand screw clamps in the writer's shop.



How to arrange glue corner

The making and installing of the above clamps was a cutting, welding, and drilling job accomplished in connection with the school welding shop.

The gluepot which can be seen in the illustration is a factory made electric heating device and can be used in connection with almost any shop situation.

ALUMINUM SALT AND PEPPER SHAKERS

THURSTON M. ROTHROCK

Public High School

St. Charles, Mo.

A very practical machine-shop project containing a number of the required learning units of the machine-shop course may be obtained in making the aluminum salt and pepper shakers described here.

In a machine-shop class there are always some boys who do not see the practicality of making hand tools such as hammers, punches, chisels, vises, etc. Although such projects offer many learning units they may cause some of the boys to lose interest in the course. In order to counteract this, useful projects that may be used in the home should be developed and worked in at various times.

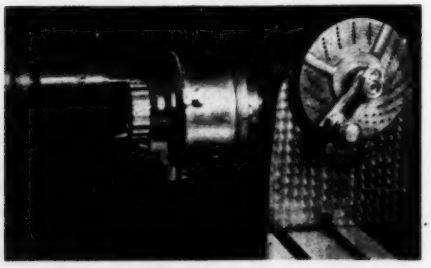


Fig. 2. A fixture for milling the flutes on the base

Fig. 3. The lathe set-up for turning base and top of shaker. Tailstock center has been removed and the radius of the top has been finished

Such a project is illustrated in the form of the salt and pepper shakers made from 24 S.T. aluminum.

The set illustrated is made from 2⅛ O.D. aluminum according to the specifications set up in the illustrations accompanying this article.

If a number of sets are to be made during the course of the class, it is well to make two fixtures, one for turning and milling the base and the other for turning the top of the shaker. A detail of the fixtures is shown. Fixture A—3 on the drawing is used for turning the O.D. and bottom of the base. It is also used for milling the grooves in the base. Fixture B—4 on the drawing is for turning and finishing the top of the shaker.

Fig. 4. How the top and base of the shakers are assembled

The stock is first cut off, two pieces for the bases and two pieces for the tops, allowing enough stock, of course, for removing center holes and finishing.

The base is machined by chucking the O.D. and facing the end. The piece is then bored to depth and threaded on the inside using the fixture A as a thread plug gauge. Both bases are so machined. The fixture A is then chucked in the lathe, indicating for trueness and the base is screwed on this fixture. The O.D. of the base is turned and the bottom is finished according to the dimensions shown.

Fixture A is then chucked and indicated true in the dividing head chuck and the base is again screwed on the fixture. The milling machine and the dividing head are then set up for milling the slots on the periphery of the base. As shown in Figure 2 an end mill was used, held in a drill chuck in the milling machine spindle. The method used may be varied according to the equipment at hand. Both bases are milled while the setup is intact.

To machine the tops, chuck the workpiece true and face the end. Center drill the end and drill 3½ in. deep with a ⅞-in. drill. The inside is bored according to the print and the outside threads are cut, using the completed base as a thread gauge. Both tops are machined in this setup.

The outside of the top part of the shaker is next machined. Chuck the Fixture B true in the lathe by indicating the 2-in. diameter and its shoulder. Screw the top into the fixture.

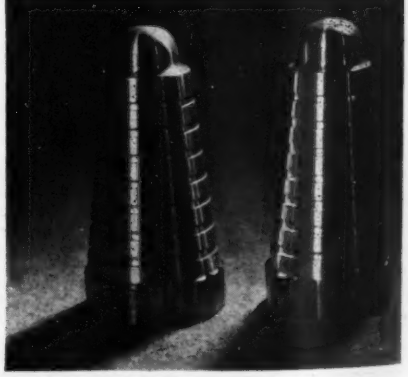


Fig. 5. The completed shaker set

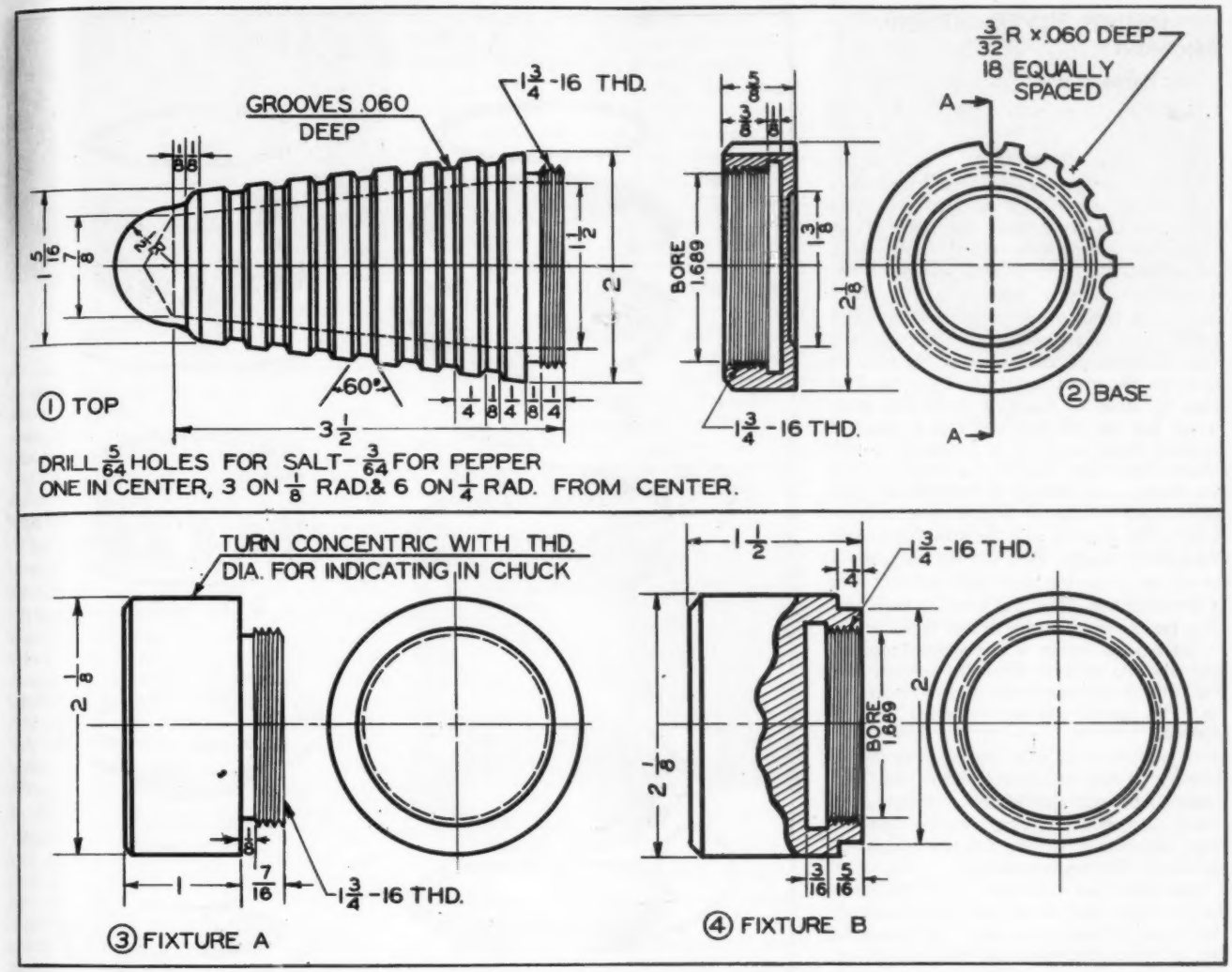

GROOVES .060 DEEP
1 3/4 -16 THD.
3/32 R x .060 DEEP
18 EQUALLY SPACED
A
BORE 1.689
60°
1 TOP
2 BASE
DRILL 5/64 HOLES FOR SALT- 3/64 FOR PEPPER
ONE IN CENTER, 3 ON 1/8 RAD. & 6 ON 1/4 RAD. FROM CENTER.
TURN CONCENTRIC WITH THD.
DIA. FOR INDICATING IN CHUCK
3 FIXTURE A
4 FIXTURE B

Fig. 1. Details of salt and pepper shakers

using a rubber washer between the fixture and the shaker bottom to facilitate the removal of the shaker top from the fixture when machining is complete. The end is then faced and center drilled, care being taken not to drill the center hole too deep. Use a small center drill. The O.D. is next turned, the outer end of the shaker being supported by the tailstock center.

The taper is figured and turned with the compound or the taper attachment. The shaker top is then roughed out and the grooves are cut along the taper. The radius is finished and the tit with the center hole is sawed off. This part is filed to the correct radius, checking with a ½-in. radius gauge, and the top is polished with emery and crocus cloth. A bright, fine polish may be obtained by using rouge and a cloth polishing wheel. Machine both tops while the lathe is set up. The setup is illustrated in Figure 3 with the tailstock removed from the picture.

The holes in the top of the shaker are then laid out. One hole is drilled in the center of the top; three holes, equally spaced are drilled on a ⅜-in. radius from the center, and six holes, equally spaced, are drilled on a ¼-in. radius from the center of the top. The hole sizes are given in Figure 1. Care must be taken in the drilling as it is easy to break a drill. Use kerosene as a lubricant and keep the flutes of the drill free from chips. Also use the correct spindle speed when drilling aluminum.

After the holes are drilled in the shaker tops, the tops should be replaced in Fixture B and repolished to remove the burrs thrown up in the drilling operation.

The major learning units involved in this project are as follows:

1. Grinding tools for, and the machining of aluminum
2. Internal boring to size and internal taper boring
3. Figuring tapers
4. Cutting external threads
5. Outside taper turning
6. Grooving
7. Radius turning
8. Layout and drilling of aluminum on the drill press
9. Internal boring to a flat bottom
10. Internal undercutting
11. Use of fixtures for machining projects
12. Internal threading
13. Use of milling machine and dividing head
14. Lubricants for machining aluminum
15. Polishing aluminum

All photographs and drawings are by the author.

America's Production

And last, but far from least, even now in these days of postwar depletions and scarcities, this land of free enterprise produces fully one third of the entire output of goods and services of all countries. And, that includes Mr. Stalin's Russia and the countries which are oxidizing into medieval rust behind the Iron Curtain. — *Capt. Eddie Rickenbacker.*

INDIAN SILVERSMITHING

BEN HUNT

Hales Corners, Wis.

(Continued from page 324 of the October, 1948, issue)

Saltcellars

One of the articles in silver that Indians are making today that they did not make before are saltcellars. This most likely is due to the foresight of some trader who saw sales possibilities in them for the tourist trade. There are some very pretty saltcellars shown in trading posts of the southwest of which three patterns are shown in Plate 30. The oval one is the prettiest, but also the trickiest to make. The first thing required is a die. This may be made of maple or birch end grain wood. Lay out the oval and with a gouge or crooked knife carve out a depression to the dimensions desired. The top and bottom pieces are made in the same die by hammering 24-ga. silver down into the die with a ball-peen hammer. After dapping out the two halves, file them to fit snugly. Then lay out the part to be cut out of the top piece and saw it out with a jeweler's saw. Next file it to an even surface for the twisted wire rim to fit on.

The top and bottom is first soldered together and filed up smooth. Then the bottom rim, the twisted wire edge, and the handle are put on. The handle can be dispensed with if desired.

If you are using only one grade of solder, be sure to paint the first soldered joint with rouge to prevent the remelting of the solder when successive soldering jobs are put on. The upper part of the saltcellar may be decorated with jiggle engraving.

The other two saltcellars shown are made in the same way as the one just described. Any stamped decoration must, of course, be put on before the respective band is soldered.

The spoons are simply handles soldered to dapped out half spheres.

Photographs of these three saltcellars will be shown in the next issue of INDUSTRIAL ARTS AND VOCATIONAL EDUCATION.

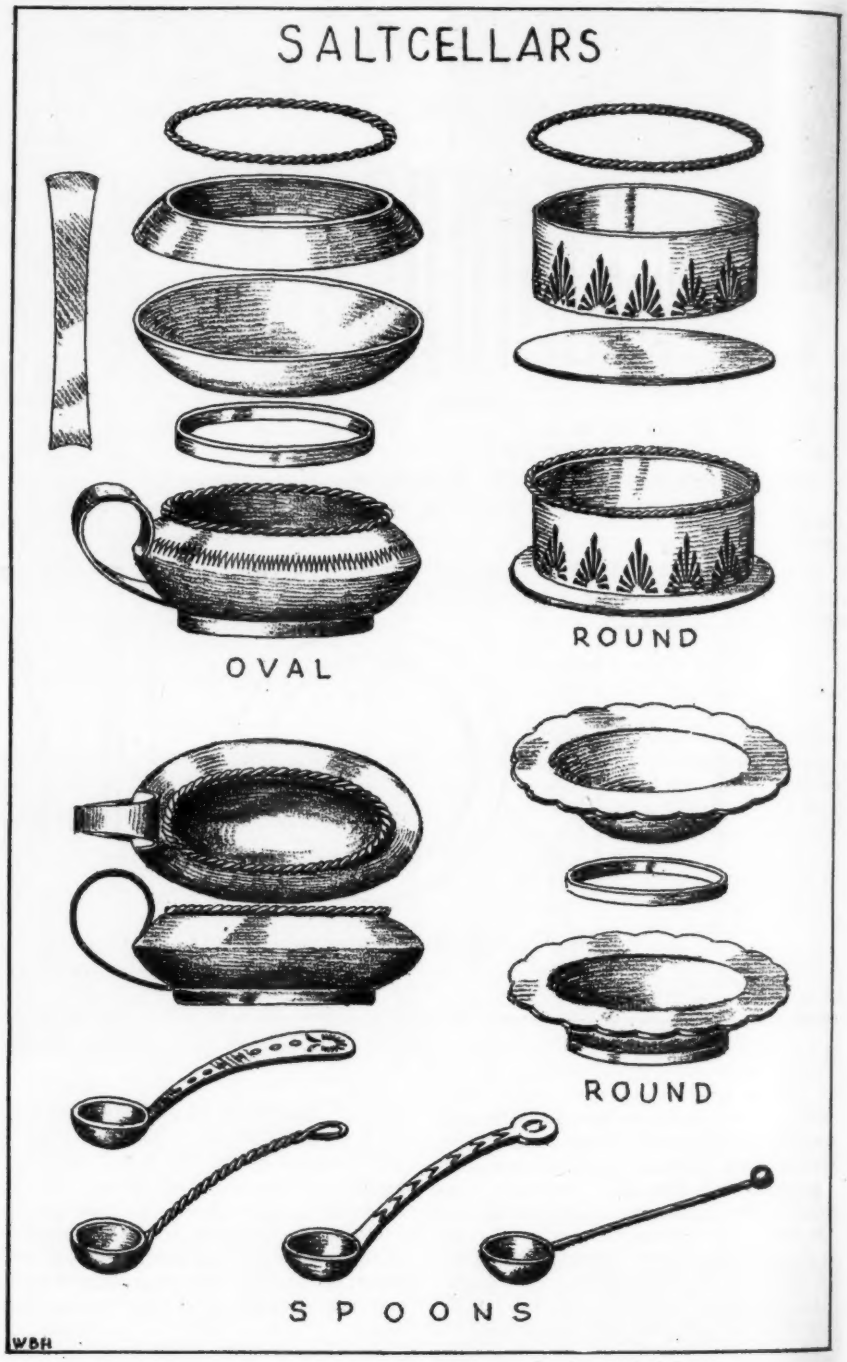


Plate 30

LET'S BIND OUR MAGAZINES

CHARLES R. KINISON

Chairman, Department of Industrial Arts
Ohio University
Athens, Ohio

Beginning teachers rely on their professional magazines for inspiration and for new ideas in planning and conducting their daily recitations. Teachers who have been in the profession for several years realize the value of these aids, and they usually save the issues of their magazines and refer to them over and over again. Many of the aids which were used and reported by good teachers of several years ago are still valuable for use in the classrooms of today, and the efficient teachers will realize this and take advantage of the many helps that are found in the back issues of their professional journals.

The industrial-arts teacher should be able to capitalize on this procedure even more than the teacher of the so-called academic subjects. The professional magazines of the industrial-arts teacher contain many articles which interpret the philosophical and psychological aspects of teaching, and they contain plans for teaching the various phases of the subject of industrial arts. They also contain teaching aids which may help the teacher to present the units of his course in an efficient and interesting manner.

In addition to these things which are contained in all teachers' professional journals, the industrial-arts teachers' magazines contain pictures, drawings, and descriptions of various articles that can be constructed by the pupils in the industrial-arts laboratories. Did any industrial-arts teacher ever get too many project ideas? We are deluged every semester by

Fig. 1. Prying up the ends of the staples

our seniors, who are prospective industrial-arts teachers, for copies of all of our instruction sheets, drawings, plans, and other instructional helps. In preparing these instructional aids, we anticipate these requests and provide a generous supply of the materials which are desired. These aids form a nucleus for the beginners' industrial-arts libraries.

We urge all of our students, and require it of some classes, to subscribe to the leading industrial-arts teachers' magazines so that they will become acquainted with the valuable helps which are published in every issue. As stated before, each issue contains drawings and descriptions of articles that can be made in the shop laboratories, and these drawings and descriptions augment the instructional aids and other materials which have been obtained to begin their professional libraries. After several issues of the magazines have arrived it is essential to find some convenient way of keeping them in good condition and in such a manner that they are easily accessible. Probably the easiest and most convenient way of doing this is to bind each volume of issues, and it is the purpose of this article to describe a simple and inexpensive method for binding these volumes so that they will stand a great deal of handling without getting dog-eared and dirty.

It is important that we know something about the method used by publishers in numbering the issues and volumes of their magazines. For convenience in identifying the issues of the magazine, each issue is given a serial number. In order to make it still easier to identify the issues, all of the numbers for a fiscal period, usually a year, are given a volume number. The number of the volume is usually designated in Roman numerals, and the issue number is usually designated in Arabic numbers, e.g., Vol. XI, No. 4.

Many magazines have the January issue as the first number of the volume, and the December issue as the last. Others may start the volume with some other monthly issue. Teachers' professional magazines often begin the volume with the September issue and end it with the June issue so that it is published only during the months in which public schools are in session. In most cases the issues for a year constitute a volume no matter with which issue the volume starts. Many of the flat-back magazines have two volumes each year, and when this happens the January and July issues are usually the first numbers in the two volumes respectively.

Fig. 2. Pulling the inside pages off the staples

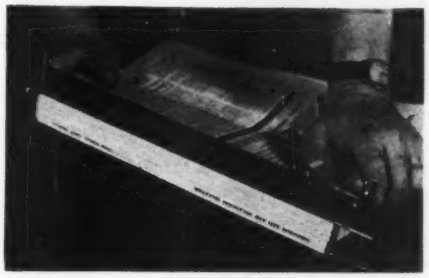


Fig. 3. Putting magazine in the clamp

The flat-back magazines, which are made up of several sections and have staples running from front cover to back cover, usually have reading matter on nearly every page with the advertisements. It is not convenient to discard any of the advertising matter when binding these magazines. In the case of the saddle-back magazines, which are made up of a single section and have staples that enter the fold at the back and are clenched at the center spread, many publishers place the advertisements in the pages at the front and the back of the book, and these can be discarded before binding.

Now that you understand something about how magazines are numbered, you should prepare for the binding operation by getting all of the issues of a volume together. You will also need a binding clamp which is described toward the end of this article, a short piece of small flexible wire, a three-foot piece of loosely wound cotton string, and some glue or padding compound. Proceed according to steps given here.

Step 1. The first step in binding is to get all of the issues of a volume together and place them in numerical order. In doing this be sure that the first issue is on top of the pile when the backs of the magazines are toward the left of the person doing the binding. If the magazines are kept in this order, the bound volume will open like a book, and the first issue will be at the beginning of the book and the last issue will be at the end.

Fig. 4. Flat-back magazines in the clamp

Step 2. Let us first consider the saddle-back magazines. Open each issue to the center spread and you will find that the staples are clenched at this point.

Step 3. Use a knife blade to lift the ends of the staples as shown in Figure 1.

Step 4. Separate the group of pages that contain the reading matter from those having advertisements by pulling the inside pages off the staples as shown in Figure 2.

CAUTION: Be sure to arrange the issues in the proper order and position as you had them before the separation job was started. It is well also to check up whether you want to take the advertising pages off. Many advertisers put much valuable material in their advertisements, and it may be well to keep the entire magazine intact. If it is decided to keep the magazine together it is not necessary to follow steps 3 and 4.

Step 5. Place the pile of magazines in the clamp as shown in Figure 3. Tighten the nuts with your fingers. Jog the books until the pile is even, and tighten the nuts with a wrench. Flat-back magazines will look like those in Figure 4 when this operation is completed.

Step 6. Drill four or five holes through the pile of magazines as shown in Figure 5. Long magazines need five holes, and shorter magazines need only three. These holes are drilled through the pilot holes in the top of the clamp, and they must be so guided that they will

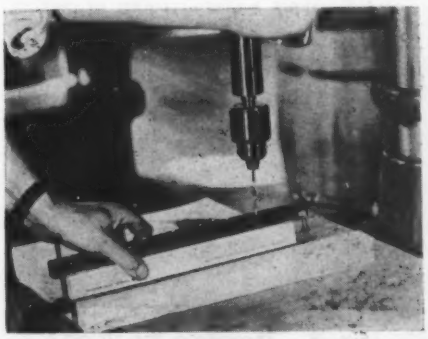


Fig. 5. Drilling the holes

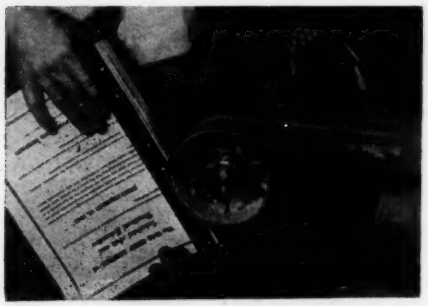


Fig. 6. Smoothing up the backs on the sander

meet corresponding holes in the bottom of the clamp.

CAUTION: The drill should be raised two or three times while drilling each hole. The shavings made by the drill soon clog the flutes of the bit, and if these shavings are not dislodged the friction of the turning drill will soon scorch the paper and overheat the drill bit. Note that the clamp is supported on a piece of wood while drilling. The assembly must be held in such a position that the bit will not run out through the backs of the magazines; it must hit the hole in the bottom of the clamp.

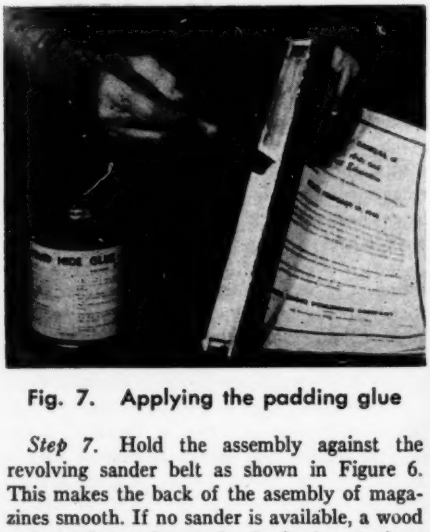


Fig. 7. Applying the padding glue

Step 7. Hold the assembly against the revolving sander belt as shown in Figure 6. This makes the back of the asembly of magazines smooth. If no sander is available, a wood rasp can be used to make the back smooth.

Step 8. Apply a liberal coating of padding glue to this smooth back as shown in Figure 7. If padding glue is not available, ordinary hot or cold glue may be used. A few drops of glycerin added to ordinary glue will make it less brittle when it has dried. Use only a few drops of glycerin and stir the mixture thoroughly.

Fig. 8. Threading the string through the holes

Step 9. After the padding glue is thoroughly dry, remove the clamp.

Step 10. Use a heavy, loosely-twisted cotton string to sew back and forth through the holes you have drilled. A loop of small wire can be used as a needle to guide the string through the holes as shown in Figure 8. Starting at one end of the book, guide the string *down* through the first hole, *up* through the second, *down* through the third, *up* through the fourth, *down* through the third again, and *up* through the second again. This brings the two ends together just outside the first hole.

Fig. 9. Marking the cover paper

Step 11. Pull the loops of the string until they are very tight, and tie with a square knot. Cut the ends of the string. Beginning with the first loop, pull each loop successively until the knot is pulled down into the top hole.

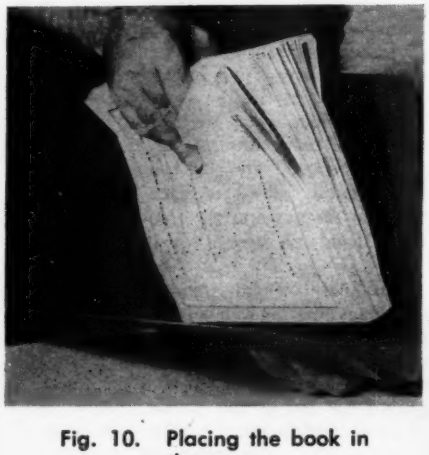


Fig. 10. Placing the book in the cover

Step 12. Get a piece of cover paper large enough to cover the book, and proceed to lay out the cover as indicated in Figure 9. A manila folder will make an excellent cover if it is large enough, but the larger sheets of colored cover paper which can be purchased at a printing office are much more pleasing and satisfactory. Begin by laying the top edge of the book along the top edge of the cover paper.

Fig. 11. Rubbing the cover to make it stick

With the open edge of the book in line with the adjoining edge of the cover paper, make a line on the cover paper along the closed edge of the book. Without disturbing the relative positions of the book and cover, turn the book up on its back and make another pencil line on the cover. The two lines will be parallel and just the thickness of the book apart.

Step 13. Fold very carefully on these lines. It may be well to make the folds a little closer together than the lines, for this will make the back fit more snugly when it is fastened to the book.

Fig. 12. Pasting bookbinders' cloth along the joints

Step 14. Apply another coating of padding glue to the back of the book, and put a coating of glue on the inside of the cover between the folds that have been made. Permit these coatings of glue to dry for a few minutes and they will become tacky and sticky.

Step 15. Place the book inside the cover

Fig. 13. Placing the name on the cover

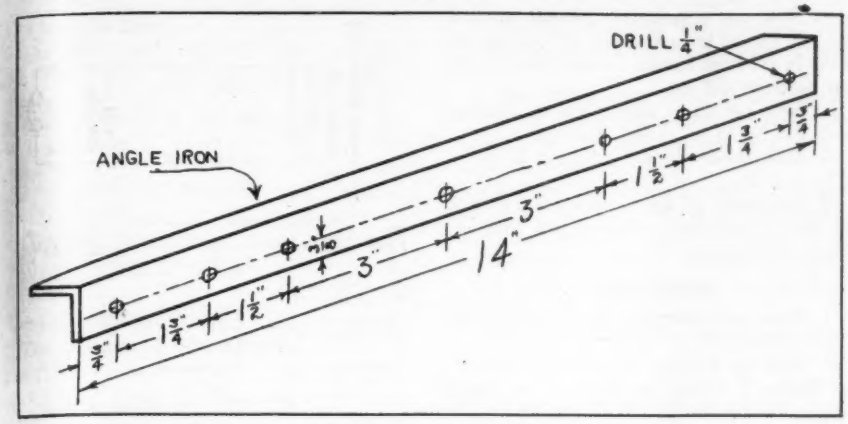


Fig. 14. Detail of the clamp

with the sticky surfaces together as indicated in Figure 10.

Step 16. Rub the back of the cover repeatedly for several minutes as shown in Figure 11. This will cause the cover to adhere firmly to the back of the book.

Step 17. Open each cover of the book, and paste strips of bookbinders' cloth along the joints so that the string is covered and the cover is more firmly fastened to the book. This operation is shown in Figure 12.

Step 18. The name and volume of the magazine may be printed on the flat back of the cover with a pen or brush as indicated in Figure 13.

How to Make the Clamp

The clamp is made of two pieces of angle iron about 14 in. long. The ¾ by ¾-in. angle iron is a good size, but other sizes may be used as long as the holes are drilled fairly close to the edge of the iron. Two ¼-in. machine bolts will also be needed. These should be about ½ in. long, and should be threaded to within ½ in. of the head. To make the clamp, proceed as follows:

Step 1. On one of the angle irons, lay out the location of the seven holes as indicated in Figure 14.

Step 2. Center-punch and drill these holes.

Step 3. Lay out the location of one end hole on the other angle iron.

Step 4. Center-punch and drill this hole.

Step 5. Place the first angle iron on top of the second so that two end holes will coincide, insert a bolt through these holes and tighten the nut.

Step 6. Mark the other end hole by using the top angle iron as a guide. Center-punch and drill the end hole.

Step 7. Insert the other bolt and tighten the nut.

Step 8. Mark the other holes, center-punch, and drill the holes.

By following the procedure indicated, a clamp can be made that will have a sufficient number of holes for large magazines, and few enough for smaller magazines. The bound volume should not be more than two inches thick or it will have a tendency to split if the pages are pushed apart very forcibly. Large volumes are heavy and difficult to handle, so do not make them so large that they are unwieldy.

After the volumes are bound there should be some means of knowing where to find the helpful articles and other items of interest in the several issues. A good way to provide this knowledge is to have a card file in which are listed the titles of the articles, the author's name, the volume, the number of the issue, and the page number. A card should be provided for each article, and the cards should be filed in alphabetical order with the principal word of the title determining the location of the place where the card will be filed. Often the article should be listed on two or more cards so that it can be filed in more than one place. Such cross references make it easier for a person to find this material after it has been catalogued. A library of bound volumes of professional magazines, together with a well-organized card file of the materials in these volumes, are very valuable assets for any teacher of industrial arts.

A CRYSTAL RADIO RECEIVER

ALBERT KOSLOFF
Industrial Arts Laboratory
Waller High School
Chicago, Ill.

Scientific advance today is rapid and is making all phases of life so interdependent that every subject learned has a tentative value. However, there are always basic elements that are common to any subject. In teaching elementary radio a crystal radio receiver is practical and ideal to present as a first project.

The crystal radio receiver explained here has student interest, is easy to make, offers experience in elementary processes, is inexpensive, and works well. Most of the parts, with the exception of the fixed condenser and the crystal detector, may be made. However, if it is desired, any of the parts may be bought in a radio shop. The cost of the radio should range from about 15 cents to 1 dollar, depending on the type and number of parts bought.

BILL OF MATERIAL

1 piece of dry broomstick or a 1-in. diameter dowel rod, 9 in. long
2 angle irons, any sheet metal, each 2 by ½ in.
20 yards of No. 22 or No. 24 magnet wire, double cotton covered, for secondary and primary coil and for connections
1 piece of wood for radio base, ¾ by 9 by 12 in.
2 pieces of wood, for legs of base, each ⅜ by ⅜ by 9 in.
2 pieces of sheet metal for plates of variable condenser, each 4⅛ by 3½ in., 26 to 20-gauge metal
2 strips of wood for variable condenser, each ⅜ by ¾ by 3½ in.
1 piece of celluloid, for variable condenser, 6 by 6 in., about .005 to .015 in. thick
1 crystal detector (a fixed detector may be used)
1 fixed condenser, .001 microfarads
Binding posts, 7 required; these may be 3/16 by 1-in. machine screws with two nuts for each screw, or Fahnestock clips may be used
6 roundhead wood screws, about ½ or ¾ in. long
Shellac or lacquer
About 10 brads, 1 in. long
Solder, 50–50
1 piece of ½-in. dowel rod to serve as knob for movable plate of variable condenser, about ⅝ in. long
Emery cloth
Sandpaper
Headphones, about 2000 ohms

Procedure

1. Cut a piece of dry broomstick or a 1-in. dowel rod so that it is 9 in. long.

2. File ends flat on rod.

3. Make two angle irons, each 2 by ½ in., from a piece of sheet brass, copper, aluminum, or tin from a tin can.

4. Drill two holes in each piece and bend and shape angle irons as shown in Figure 2.

5. Smooth off all edges with emery cloth.

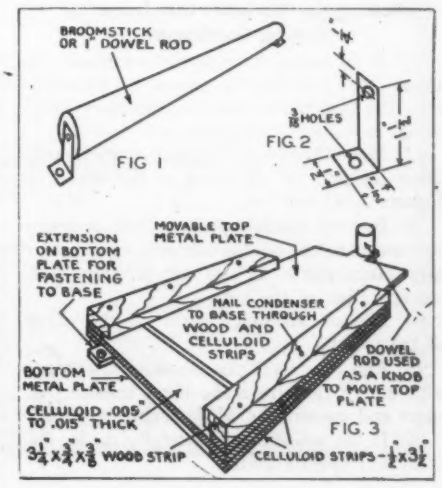
6. Attach angle irons with wood screws in the center on the ends of the broomstick as illustrated in Figure 1.

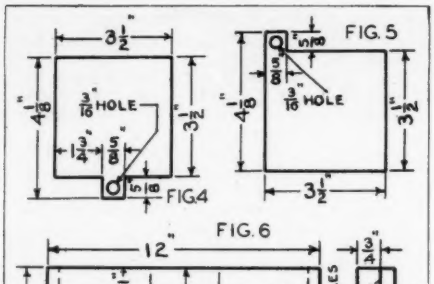
7. Sandpaper the wood well and give the whole form about two coats of shellac or lacquer, allowing enough time for coats to dry.

Winding Secondary and Primary Coils

1. Drill a 3/32-in. hole through the dowel rod about ½ in. from one end of the rod.

2. Pull one end of the magnet wire through the latter hole and allow about 1 ft. of wire


BROOMSTICK OR 1" DOWEL ROD
FIG 1
3/16 HOLES
FIG. 2
EXTENSION ON BOTTOM PLATE FOR FASTENING TO BASE
MOVABLE TOP METAL PLATE
NAIL CONDENSER TO BASE THROUGH WOOD AND CELLULOID STRIPS
DOWEL ROD USED AS A KNOB TO MOVE TOP PLATE
BOTTOM METAL PLATE
CELLULOID .005" TO .015" THICK
3 1/4" X 3/4" X 3/8" WOOD STRIP
CELLULOID STRIPS - 1/2" X 3 1/2"
FIG. 3



to extend out for connections at the starting and finishing of the windings.

3. Wind 200 turns around the dowel rod or broomstick. Make one layer and wind the turns closely and evenly in the same direction. Be careful not to unravel the cotton covering on the wire. *These 200 turns of wire make up the secondary coil.*

4. Now drill another small hole near the end of the last turn of the secondary coil and pull the second end of the wire through the small hole to keep the turnings from unraveling.

5. Give these windings a good coat of shellac or lacquer and allow finish to dry well.

6. In a similar manner wind 70 turns of wire, starting about 3 in. from one end of the form. Wind these turns carefully around the secondary coil. This coil must be wound in the same direction as the secondary coil. Again, allow about 1 ft. of wire for connections at the start and finish of the winding.

7. In starting to wind the 70 turns make an overhand knot with the wire around the secondary coil so that the turns will not slip. Do the same when you finish. *These 70 turns make up the primary coil.*

8. Give the primary coil a coat of shellac or lacquer.

Making the Variable Condenser or Tuning Condenser

1. If a tuning or variable condenser of about .0005 microfarads cannot be obtained, then the homemade variable condenser illustrated in Figure 3 can be made.

2. Make the two metal plates of aluminum, brass, copper, or tin from a tin can. See Figures 3, 4, and 5.

3. Be very careful not to scratch or make any indentations on the surfaces of the two sheet-metal plates, as this will interfere with the operation of the radio.

4. File off all rough spots on the edges of the metal.

5. Rub the metal plates around the edges with emery cloth to make them smooth. All edges and corners should be slightly rounded.

6. If the condenser is carefully made, the radio will operate better.

7. Now cut a piece of celluloid so that it is 4½ by 3½ in., and about .005 to .015 in. thick. If celluloid cannot be obtained, an old film negative will do.

8. Next cut six to eight strips of celluloid about 3½ by ½ in. in size. See Figure 3.

9. Make two wooden strips, each ⅜ by ¾ by 3½ in.

10. Sandpaper off all rough spots and give the two wooden strips one or two coats of shellac or lacquer.

Radio Base

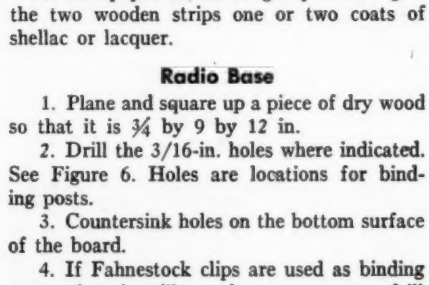
1. Plane and square up a piece of dry wood so that it is ¾ by 9 by 12 in.

2. Drill the 3/16-in. holes where indicated. See Figure 6. Holes are locations for binding posts.

3. Countersink holes on the bottom surface of the board.

4. If Fahnestock clips are used as binding posts, then it will not be necessary to drill holes, but the clips will be put on the top surface in the same spots where the holes are drilled.

5. Make the two wooden strips or legs for the base, each ⅜ by ⅜ by 9 in.



6. Nail the legs to the bottom of the base as shown in Figure 6.

7. Sandpaper the wood and cover the whole base and legs with a good coat of shellac or lacquer.

Assembling Radio

1. Place the form around which the coils are wound in the location shown in Figure 7.

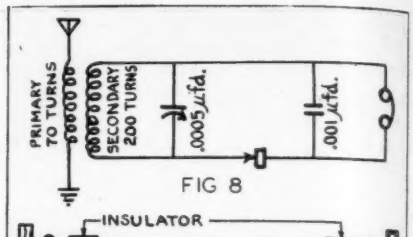
2. Drill 3/32-in. holes in the base and attach angle irons and coil form to wooden base with ½ or ¾-in. wood screws.

3. Attach ends of primary coil to binding posts marked "aerial" and "ground." See Figures 7 and 8.

4. *Be sure that all enamel or insulation is scraped off the wire where connections are to be made,* otherwise the radio may not work.

5. Similarly, connect the two ends of the secondary coil to the binding posts. If possible, have the wires run underneath the base. The radio will look better if only the parts are on top of the base. The wires may be brought under the base by drilling 3/32-in. holes through the wood and pulling the wires through the holes.

6. Next loosen screw holding knob to movable plate of variable condenser and connect a piece of wire about 1 ft. long between



knob and sheet metal. Make sure that there is perfect contact between wire and metal.

7. Now place bottom metal plate in the approximate position shown in Figure 7.

8. Drill a 3/32-in. hole in the base and fasten bottom plate to wood with a ¾-in. wood screw. Before driving down screw, connect a piece of wire about 1 ft. long between sheet metal and wood screw, making sure that wire has been cleaned well before connecting.

9. Place celluloid strips against the sides of the bottom metal plate of variable condenser and put the 4½ by 3½-in. piece of celluloid between the two metal plates. Arrange the parts of the condenser as shown in Figure 3. Make sure that the 3½ by ½-in. strips of celluloid equal the thicknesses of each of the metal plates.

10. Drill very small holes through the wood and celluloid strips and nail variable condenser to base as illustrated in Figures 3 and 7. It is important that the top movable plate hug the celluloid sheet but it should move back and forth rather easily.

11. Attach crystal detector to base.

12. Connect fixed condenser as illustrated in Figures 7 and 8.

NOTE: Wherever connections have to be soldered the soldering must be neat. Don't apply too much solder, and wipe off all the flux immediately, if flux is used.

Operating the Radio

Antenna or Aerial

Before starting to operate the radio, we must first make sure that we have a good aerial. The aerial may be a single strand of wire about 50 to 75 ft. long or it may be made up of fine copper wires stranded or twisted together. For better operation it is advisable that the aerial be outdoors. The wire may be insulated or bare, and may be either 12 or 14-gauge in thickness. For best results, the aerial should be as high above the ground as is practical. An insulator is attached at each end of the aerial. See Figure 9. These insulators which are made of hard rubber, glass, or plastics prevent the small currents of electricity from leaking off the wire once the currents or radio waves are picked up by the aerial.

The Lead-In Wire

The lead-in wire is the wire that runs from the aerial to the radio. It is the same thickness as the aerial and is attached to the antenna so that it makes a good connection. It is advisable to solder the joint and then wrap tape around the joint to keep it together and to prevent air, rain, etc., from corroding it. The lead-in wire should be insulated. It should be attached to an insulator before it enters the house and should not touch anything else.

The Ground Connection

The best ground connection is a cold water pipe. A radiator or any pipe that ultimately goes to the ground may be used. However, a gas pipe should never be used. A No. 18 copper wire may be used for making the connection from the ground to the radio. The ground wire should be as short as possible.

The paint should be scraped off the pipe where the wire makes contact with the pipe. About 4 or 5 turns of bare cleaned wire may be wrapped around the cleaned spot on the pipe. For best results a ground clamp, a clamp made for connecting the ground wire to the pipe, may be used. A good protection against lightning if a lightning arrester is not used, is to make sure that the antenna system is grounded when the antenna is not used.

"Listening In"

1. Before using the crystal radio receiver, make sure that all parts are connected correctly.

2. Connect the ground and aerial lead-in wire to the binding posts on the radio. See that aerial lead-in wire is insulated.

3. Connect the headphones to the binding posts as shown in Figures 7 and 8.

4. Now adjust the headphones on your ears and move the "cat's whisker" over the crystal detector until a sensitive spot is found. This operation is not necessary in a fixed crystal detector.

5. Move the movable plate of the variable condenser in one direction until gradually one station is tuned on and the desired station is brought in more strongly.

6. If there should be difficulty in the operation of the set, reverse the ground and aerial connections and check other connections. With a little experimentation it should be possible to hear local stations or stations at least within a 25-mile radius.

7. After some trials the listener may mark spots on the wooden strips of the variable condenser to indicate how far the movable plate should be moved and to indicate where to tune in the desired stations.

PRINTING A MONTHLY CALENDAR OF EVENTS

ISRAEL BENSMAN
Central High School
Sheboygan, Wis.

In addition to a series of projects done individually by the printing student, instructors will find that some of the projects can be planned, set up, and printed on a group basis.

The writer has used variations of the illustrated "Calendar of Events" as one of the group projects for five years, and has found it answers one of the objectives of industrial arts: the opportunity for students to plan and work out co-operatively, some problem to their mutual interest and satisfaction along with other students.

The use of a monthly calendar of events for a group project is suggested because the calendars are actually printed and distributed to each teacher, who then exhibits them on the classroom bulletin board. The copy is submitted by the office and is as nearly accurate as it is possible to schedule school activities for a month in advance. The students working on this type of a project are especially interested because they know the work is timely, serves a definite need in school, and is exhibited as their work.

DISPLAY BOARD

JOHN B. FULLER
Central Junior High School
New Britain, Conn.

One of the problems that confronts industrial-arts instructors is to make a proper

Display board

Central High School Events Calendar

JANUARY 1947

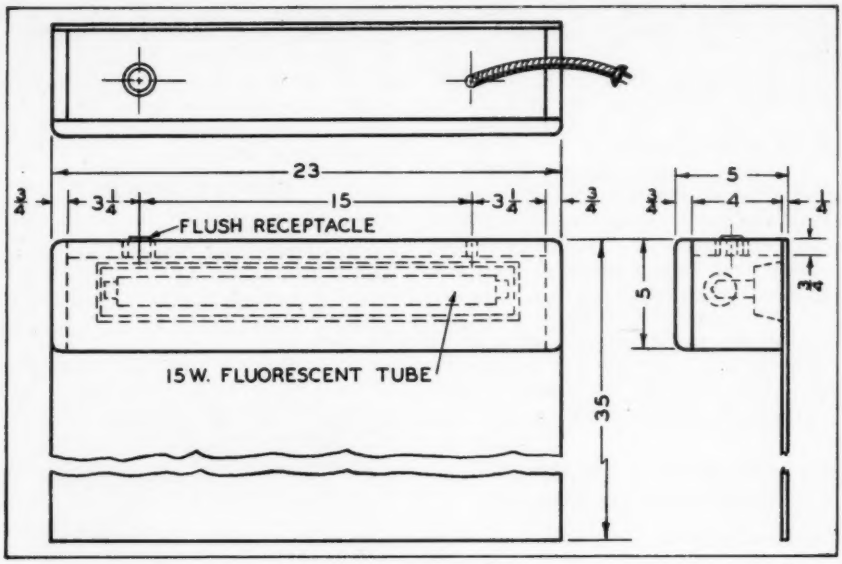
Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
	Committee Rooms Social 302 Serv.-Welfare 321 Organization 215 Noon Hour 321	Publicity 311 Finance Bank Constitution Mr. DeWaard's Office	1	2	3	4
5	6 School Begins Senate Meeting	7 Nomination Papers Due	8 Movie "Junior Prom" "Basketball Techniques"	9 General Assembly Nominating Speeches	10 Pep Meeting Basketball Appleton Here	11 Dance
12	13 Senate Committee Meeting Home Room	14 Lyceum-Joe Ellis Basketball Central at East	15 Movie "Pacific Coast" "Song of Revolt"	16 Home Room Fresh.-Soph. Panel Discussion Primary Election	17 Pep Meeting Final Election Basketball Manitowoc Here	18 N.F.L. Student Congress Ice Carnival (optional date)
19	20 Senate Meeting Home Room	21 Home Room	22 Movie Community Sing "17 Days"	23 Home Room	24 Pep Meeting (Optional Date for Ice Carnival)	25 Basketball North-Central at Armory End of Semester
26	27 Election of Senators Home Room	28 Lyceum 9 a. m. Installation of student body officers	29 Movie "Palestine"	30 Milw. State Teachers College Orchestra	31 Choir Basketball at Oshkosh	Ice Carnival (optional date)

Central High School Events Calendar

FEBRUARY 1947

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
	Committee Rooms Social 302 Serv.-Welfare 321 Organization 215 Noon Hour 321	Publicity 311 Finance Bank Constitution Mr. DeWaard's Office				1
2	3 First Senate Meeting New Senate Homeroom	4 General Assembly Band Concert	5 Movie "Builder of the Broad Highway"	6 General Assembly Orchestra Concert	7 Pep Meeting Basketball West at Central	8
9	10 Lyceum Capt. Art Hook "Deep Sea Diver"	11 Lyceum "Charm Quartette"	12 Movie "Young Mr. Lincoln" Midyear Concert	13 General Assembly Lincoln Program	14 Pep Meeting Bskt.-Food du Lac at Central	15 Dance (North Invited)
16	17 Senate Committee Meetings Assembly	18 General Assembly Science Program	19 Movie "Children of China" "British Empire"	20 General Assembly 2:45 House of Magic	21 General Assembly Washington Program Bskt.-Central at Appleton	22 N. F. L. Debate Tournament
23	24 Senate Meeting	25 Pep Meeting Basketball East at Central	26 Movie "Great Lakes" "Philippine Islands"	27 Lyceum-Torrini & Phyllis "Magic at its Best"	28 Homeroom Basketball Central at Manitowoc	

Calendar of events



Display board

display of the small projects that are made in their shops.

The display board described herewith was originally built at the Central Junior High School in New Britain, Conn. It was later adopted as to size and type by the Connecticut Industrial Arts Association, and it was first used at the tenth annual meeting of that organization in Hartford.

The panels from the different schools were mounted at the same height, side by side around the room. Each panel was lighted by a 15-watt fluorescent tube which is under the cornice. The lighting circuit is plugged in at the top on the right side of the first panel. The second display board (left) is then lighted by plugging in on the first display board. By thus wiring one board to the other, any number of panels may be lighted on one circuit.

This display board has eye appeal, is easily put up, and the educational value derived by interchanging displays with other schools is very great.

BILL OF MATERIAL

No. of pcs.	*Name*	*Material*	*Size*
1	Back	Plywood	¼ x 23 x 35 in.
1	Top	Pine	¾ x 4 x 21½ in.
1	Front	Pine	¾ x 5 x 23 in.
2	Ends	Pine	¾ x 5 x 4 in.
1	Extension cord—rubber		30 in. long
1	Fluorescent fixture complete — 15 watt		
1	Flush receptacle		
1	Two-prong plug		

HANDY AUDIO-VISUAL PROJECTION EQUIPMENT TRUCK

MILES H. ANDERSON
Assistant State Supervisor of Instructional Materials
Oakland, Calif.

One of the most difficult problems in the use of motion pictures in classroom instruction is that of transporting the projection equipment

Fig. 1. The truck in the closed-up position

from one room to another in the school without a great deal of lifting of heavy equipment and the loss of valuable class time.

Donald S. Newcomer, supervisor of audio-visual aids, Burbank City Schools in Burbank, Calif., has worked out a solution to this problem that is increasing the use of motion picture films in the Burbank City Schools by a large margin over the utilization before this machine was available for use.

As can be seen in Figure 1, the machine, when folded up, looks a great deal like an ice cream peddler's pushcart, and being mounted on rubber tires, it can be rolled easily and quietly from one room to the other as illustrated.

On arrival in the room where it is to be used, the projector is set up by folding back the top leaves on the cabinet and turning the crank on the front, which automatically raises

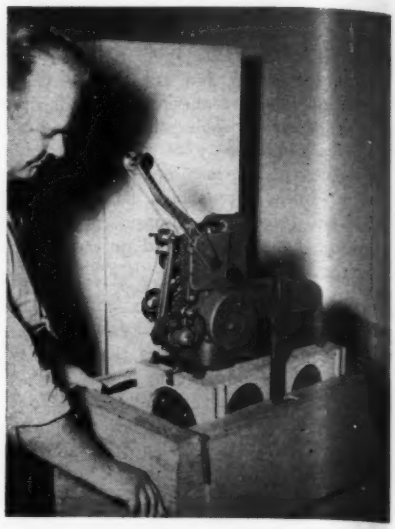


Fig. 2. Raising the projector to the operating position

the projector and loud-speaker assembly through a rack and pinion arrangement, the rack of which can be seen just in front of the projector. The weight of the projector is counterbalanced on the side away from the rack and pinion by the use of two window spring counterbalances, such as are used in modern homes for assisting in lowering and raising windows.

When the machine is raised to operating position, the power supply cord is plugged in, and the film is threaded as shown in Figure 3. The projector is turned on, and showing of the film starts as shown in Figure 4. In the latter figure is also seen the portable screen assembly, which can be used in an ordinary lighted classroom without special blinds on the windows. This is possible because of the top and wings which exclude light from the windows reaching the screen.

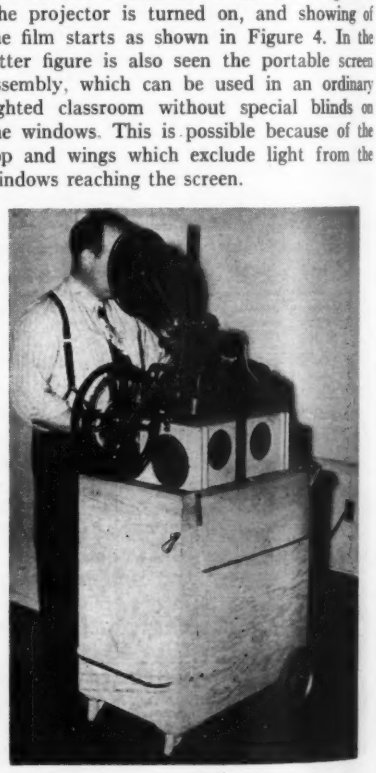


Fig. 3. Threading the film

Fig. 4. Ready to show the film

When a showing of the film is completed, the machine is folded up by reversing the procedure previously described, whereupon the entire assembly may be rolled to another classroom or to the storage room with a minimum of labor and loss of time.

The entire machine was designed and built by the staff of the Burbank City Schools. Much of the mechanical work was done by Clifford Dobson, supervisor of trade and industrial education, who is shown in the photographs demonstrating the use of the equipment.

METAL DESK TRAY

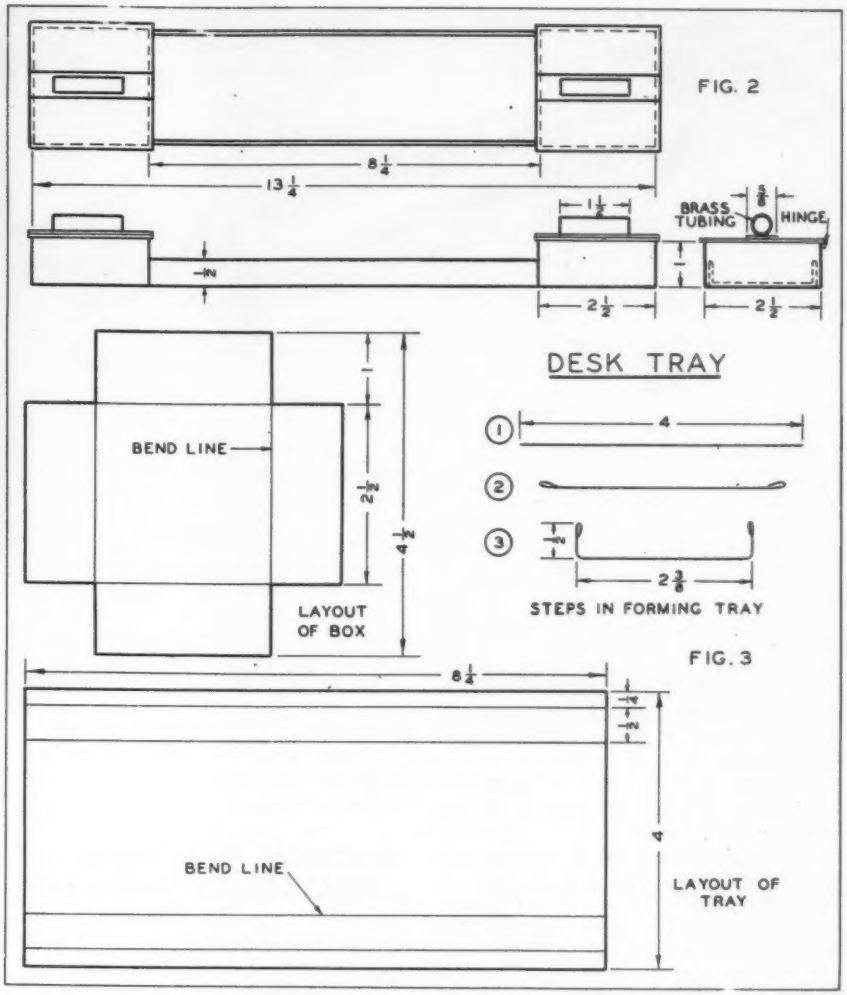
HOMER C. ROSE
Falls Church, Va.

This brass tray will prove useful on almost any desk. The containers are designed to hold paper clips, stamps, or small change. The center part of the tray illustrated in Figure 1 is more difficult to construct than that shown in Figures 2 and 3. The suggested procedure is for the tray indicated in the drawings.

BILL OF MATERIAL

No. of pcs.	*Name of part*	*Material*	*Size*
2	Container	20-ga. brass	4½ x 4½
1	Tray	28-ga. brass	4 x 8¼
2	Cover	20-ga. brass	2⅝ x 2⅝
2	Plate	20-ga. brass	¾ x 2⅝
2	Tubing	⅝ O.D. tubing	⅝ x 1½
1	Hinge	28-ga. brass	¼ x 12

(Small pieces as indicated in procedure)



Figs. 2 and 3. Details of desk tray

Suggested Procedure

Container

1. Cut two pieces of 20-ga. brass to 4½ in. square.
2. Lay out the containers as shown in Figure 3.
3. File the side parts where they will come together to 45 deg. miter so that when the sides are bent up they will form a miter joint.
4. Cut two hardwood blocks to 2½ in. square and approximately 1 in. thick.
5. Locate these carefully on the bend lines, one on each side of the metal, and clamp securely in vise.
6. Form the sides over with suitable mallet.
7. Remove the blocks and carefully adjust the bends to bring the corners together.
8. Wrap wire around the box to hold the corners in contact.
9. Solder the corners on the inside.
10. Round the corners slightly with single cut file.
11. Repeat steps for the second container.

Tray:

1. Cut the metal to size as shown in Figure 3.
2. With bar folder bend the metal as shown in Steps 2 and 3.

Cover and Handle:

1. Cut two pieces of 20-ga. brass to 2⅝ in. square.
2. Round the corners slightly.
3. Cut two pieces of 20-ga. brass to ¾ by 2⅝ in.

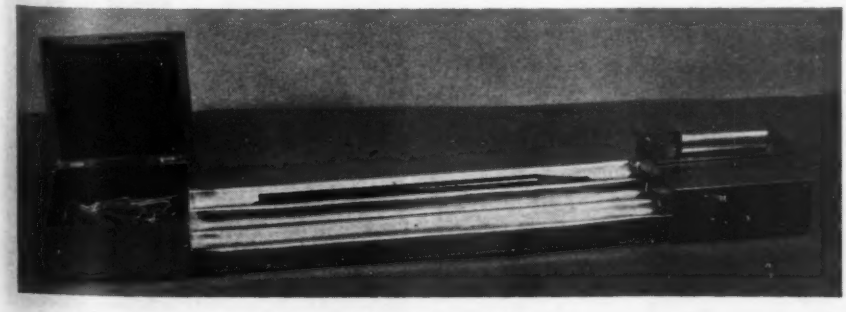


Fig. 1. Desk tray in brass

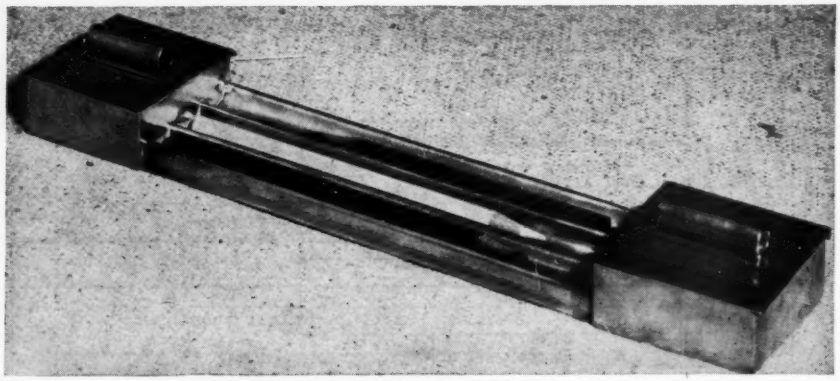


Fig. 5. Metal desk tray

4. Round the corners slightly.

5. Cut two pieces of approximately ⅝ in. O.D. tubing to 1½-in. length.

6. Round the ends of the tubing slightly in the lathe or drill press, or by careful filing on the bench.

Hinges:

The hinges are made by wrapping narrow pieces of thin brass around a small pin or rod. Alternate parts of the hinge are then soldered to the container and the other sections to the cover. The following procedure is suggested:

1. Cut a strip of brass to a ¼-in. width and approximately 12 in. long.

2. Secure a 5-in. piece of steel wire approximately 1/16-in. in diameter. Be sure this is perfectly straight.

3. Wind the extreme end of the brass strip around the wire and cut to length so as to form a short tube.

4. Continue making these tubes until the entire length of the wire is covered.

5. Cut through the center to make two hinges.

6. Remove all excess metal with a file.

7. Polish all parts, including containers and the tray as desired. For this project a high polish is recommended.

Procedure for Assembling

1. Place containers and tray bottom side up.

2. Block the tray up to the proper height so that it is flush with the bottoms of the containers.

3. Weight the containers down so that they do not move during the soldering process.

4. Carefully solder all joints.

5. Mark the location of the cover parts.

6. Coat the parts with solder where they come in contact.

7. Place the parts in their proper location.

8. Hold them down with a rod or other suitable device.

9. Sweat solder the parts together with a soldering flame.

10. Repeat for the second cover.

11. Clamp one cover in place.

12. Lay the hinge in place between the cover and container.

13. Adjust as necessary.

14. With a small soldering copper solder alternate parts to the box and the remaining sections to the cover.

15. Clean and repolish as necessary.

Alternatives

A number of designs may be used for the center portion of the desk tray. The form shown in Figure 1 is recommended for those experienced in metalwork since it adds considerable strength to the soldered joint.

The insides of the containers and the bottom of the center part may be covered with imitation leather.

A great variety of handle designs may be adapted to this project, or the handle may be omitted entirely.

ELECTRICAL INSTALLATION AND PRACTICE — AN INSTRUCTION SHEET

ELMER C. O'DONNELL
Vocational High School
New York City, N. Y.

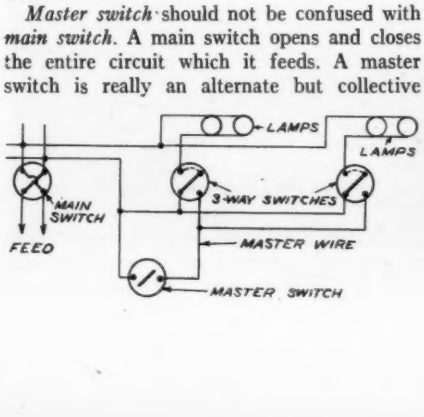
Master or Emergency Circuits

Object: Study of master circuit control. Practice in construction of the circuit.

Information: Master circuit control, sometimes called *emergency* or *burglar* circuit, may be installed for emergency control of lighting for any use. The circuit is often used in private residences for the control of first-floor lights, or outside lights, or both. The *master switch* is located near the bed in the master bedroom.

The word *master switch* is not applied because of the type or construction of the switch, but rather because of its function in the circuit.

Master switch should not be confused with *main switch*. A main switch opens and closes the entire circuit which it feeds. A master switch is really an alternate but collective cut-in control for individual lights or circuits which are ordinarily operated by other switches. The diagram shown herewith clearly indicates this.



To make a master control circuit effective, lamp fixtures should be out of reach or be equipped with keyless sockets, in which the lamps can be locked. A *backed-out* lamp or an *opened* key socket will prevent the lamp from being lighted.

Job: Draw a diagram of three lamps, each independently controlled by a switch but so arranged that they may be cut in by closing a single-pole master switch, regardless of whether they are lighted or not, at the time the master switch is closed. If this is properly connected, they cannot be extinguished by their individual switches, unless the master switch is opened.

After the instructor has checked the diagram, construct the circuit in conduit on a work board. Connect and test it.

Additional information: Large installations of a master circuit (larger than one-branch circuit) must be so divided and fused that any master wire and its protecting fuse will not have a possible load exceeding the amount permitted for branch circuits. Such an installation can be wired to conform to the code requirements by using multipole switches (see Croft, "Lighting Circuits and Switches," p. 209, Fig. 301) or on very large installations, by the use of a multicircuit remote controlled switch.

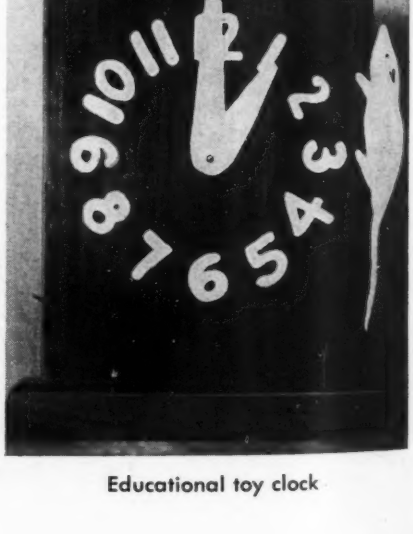
Questions: Can single pole switches be used in place of three-way switches at individual controls? Explain.

Reference: Croft, "Lighting Circuits and Switches."

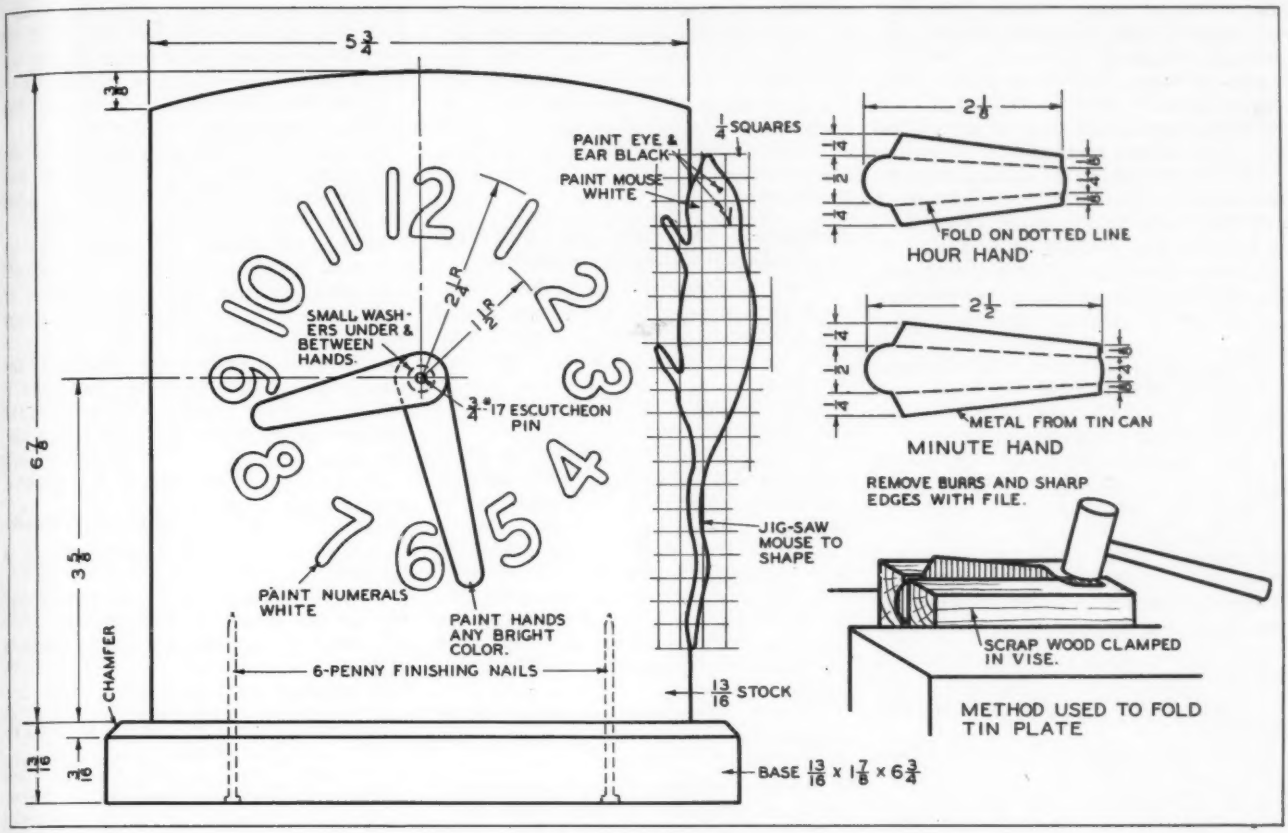
EDUCATIONAL TOY CLOCK — HICKORY DICKORY DOCK

HARRISON NEUSTADT
New York City

A couple of scraps of lumber and tin make an educational toy with which a youngster can easily be taught to tell time.



Educational toy clock



Educational toy clock

The upright piece is jig-sawed to shape, the base is chamfered and nailed to it: Sandpaper well, and with compass and pencil, lay out the clock numerals.

Stain (omit stain if dark wood such as walnut or mahogany is used), and when stain has dried apply shellac. Paint mouse and numerals with white enamel. Paint eye and ear of mouse black. The hands are made of tin can metal cut to the pattern shown, and bent by clamping between two pieces of wood and hammered over. Remove burrs and sharp edges with a file. Paint hands a bright color and attach with several washers and a No. 17 by ¾-in. escutcheon pin.

ELEMENTARY AUTO MECHANICS

FRANK B. MILLER
Central High School
Tulsa, Okla.

(Continued from page 298 of the September, 1948, issue)

Assignment Sheet No. 17 — Cleaning a Carburetor

Why this is done: A carburetor contains several small passages through which gasoline must flow. In order to insure proper operating conditions the carburetor must be kept clean and free from obstructions.

Procedure:

1. Remove gas lines and control rods from carburetor.
2. Remove carburetor from manifold, taking care of gasket.
3. Remove bowl from carburetor, and take out float and valve.
4. Wipe out all sediment from bowl.
5. Clean out all passages in carburetor by flushing with gasoline and blowing.
6. Replace bowl and float, and test float valve by holding carburetor upside down and sucking on gas inlet connection.
7. Put some gas in the bowl, and check action of accelerator pump.
8. Replace carburetor on manifold, making sure the gasket is properly lined up.

CAUTION: Do not draw bolts up too tight — a snug fit is sufficient, as excessive pressure will break off a flange.

9. Replace gas line and check for leaks.
10. Replace control rods and test operation.
11. If any adjustments were disturbed, replace them to approximate position for final adjustment when motor is running.

Questions:

1. Why does a carburetor have to be clean?
2. What would result from a leaking float valve?
3. Why is there a gasket between carburetor and intake manifold?

Text reference: ....

Assignment Sheet No. 18 — Removing Valves and Lifter Clusters From L-Head Motor

Why this is done: In order to examine and recondition or replace valves and seats, the valves must be removed from the block.

Procedure:

1. Be sure all valves are clearly numbered before removing.

NOTE: Get instructor's O.K. before removing valves of a motor new to the shop.

2. Note the valve springs, and select a heavy-duty or ordinary valve spring lifter according to the spring weight.
3. Adjust the lifter jaws, one to fit the width of the valve stem and lifter, and the other to fit *snugly* under the valve washer.
4. Turn the motor over until the valve to be removed is down in its seat.
5. Insert the lifter jaws (cup jaws up) between the bottom of the valve spring washer and the top of the valve tappet guide and squeeze the lifter handle together.

CAUTION: To prevent mashed fingers by a lifter slipping out: (*a*) always be sure the lifter jaws are properly adjusted and have a firm position; (*b*) never let go of the compressing tool while the spring is compressed, as it usually kicks back off the valve violently when so released.

6. Tap the valve head, and wiggle the lifter until the valve drops down in its seat.
7. Remove the valve key by hand, or push it out with a screw driver.

NOTE: Valve keys are small and care must be taken to avoid losing them. It is usually best to have the oil pan off, as keys commonly drop down to the oil pan when they are being removed.

NOTE: Unless spring is broken, or block needs cleaning, valve springs and washers are *not* usually removed. If necessary, however, they can be pried up and out by hand or with a screw driver.

8. Drop valve in valve rack or pan, and be sure to put all keys in a pan.

9. Repeat for all valves, racking them in proper order.

10. Check valve lifter clusters for numbering and remove any oil line connections.

CAUTION: Use only end wrench of proper size on oil line fittings. Never use pliers as that rounds off and destroys the copper fitting.

11. Remove clusters, wash with kerosene, and then oil lifters in guides.

Questions:

1. Why should valves be numbered?
2. Why does a valve have to be seated before it can be removed?
3. Why does the valve lift up when the lifter compresses the spring?

Text reference: ....

Assignment Sheet No. 19 — Removing and Replacing Rocker Arm Assemblies

Why this is done: In order to remove overhead valves for reconditioning, it is first necessary to remove the rocker-arm assembly.

Procedure:

1. Disconnect copper oil line connections at end or center of rocker arm shaft.

NOTE: Use only end wrench of a close fit on the copper oil line fitting, as any other tool will round off the hexagon shoulders of the fittings and prevent its being tightly replaced.

2. Note the order and position of oil fittings and any connecting parts, for easier replacement.

3. Loosen the nuts or bolts holding the rocker arm assembly in place.

NOTE: Loosen all the nuts at the same time by taking a few turns on each in a rotating order.

4. Lift rocker-arm assembly off cylinder head.

NOTE: Some motors have separate or separable rocker-arm assemblies. The Hudson rocker-arms are each on a separate support. The Nash is built in sections that separate as they are being removed, and care must be taken of the small parts, especially the springs and steel balls used to keep the rocker arms in place on the shaft. The Buick rocker-arm assembly can be removed in one piece.

5. After the motor is overhauled, replace rocker-arm assembly, bolting it down snugly.

CAUTION: The assembly must be bolted down snugly to operate, but drawing the bolts too tight will break off a flange or twist off the bolt.

NOTE: If flat washers belong under the rocker-arm supports, such as the Nash, their omission will prevent adjustment for proper valve clearance.

6. Replace any oil lines and other connecting parts.

Questions:

1. What is the purpose of the oil line leading to the rocker shaft? How far does that oil go?
2. Why is the shaft assembly under a tension that lifts it up off the head a short distance as the bolts are loosened?
3. Why loosen and tighten the bolts all at the same time?

Text reference: ....

Assignment Sheet No. 20 — Removing Valves From Overhead Motors

Why this is done: In order to clean and recondition overhead valves for a better fit and better motor operation, it is necessary to remove the valves from the cylinder head.

Procedure:

1. Be sure that all valves are correctly numbered before removing.

NOTE: Get instructor's O.K. before removing valves from a motor new to the shop.

2. Place cylinder head on edge on the bench.

3. Adjust the jaw of the valve spring compressor to fit snugly over the valve washer.

4. Adjust the compressor screw pin that fits in the *center* of the valve head, so that when the compressor lever is pressed down and hooked on the locking pin, the valve keys are free to drop off.

CAUTION: Do not use this compressor for the first time without help from the foreman or instructor.

5. Pull down the compressor lever, lock in place, and remove the valve key or keys.

NOTE: Be sure to take care of keys, putting them in a tin pan as they are removed from the valve.

6. Release the compressor lever *slowly*, and put the loose valve spring and washer in a tin pan.

7. Remove valve and place in rack or pan.

8. Repeat for the other valves in turn, using the same precautions.

Questions:

1. Why center the compressing tool in the valve head?
2. Why let up on the compressing tool slowly when the key has been removed?
3. What motor part does the work of the compressing tool during motor operation, and when this happens why does not the key fall out?

Text reference: ....

Assignment Sheet No. 21 — Refacing Valves

Why this is done: For perfect closing of a valve in its seat its face or working surface must be true and parallel with the seat. This face must be reconditioned from time to time because of wear, pitting, and warping in operation.

Procedure:

1. Clean all grease and carbon from the valve stem and head by washing, scraping, and using emery cloth.

2. Place the valve in the chuck of the grinding machine so that the chuck jaws grasp the stem close to the head at a point where the stem is clean and true. Adjust the rear stop in the chuck to rest against end of valve stem and lock valve in chuck.

3. Check to see that chuck is set at the proper angle for grinding this valve.

NOTE: Most valves are faced at a 45-deg. angle but there are some of 30-deg.

4. Adjust chuck carriage stop so that the valve face can pass clear across stone, but not far enough to permit the stone to grind the valve stem.

5. Move stone back clear of valve face.

6. Turn on stone and *then* turn on chuck.

7. Bring revolving valve over in front of center of stone, and move stone up slowly until it just touches the valve.

8. Pass valve slowly across the face of the stone and back to left position.

9. Readjust stone forward by revolving the control knob about one inch, and take a second cut.

10. Repeat until the face of the valve is clear and true all around.

Questions:

1. Why is the valve revolved while being ground?
2. Why move the stone back before bringing the valve across the first time?
3. What is the advantage of grinding a valve face in a machine?

Text reference: ....

Assignment Sheet No. 22 — Cleaning a Block

Why this is done: For most efficient motor operation, it is necessary that all dirt, grease, carbon, and other foreign matter be cleaned off so as not to interfere with moving parts or fuel combustion.

Procedure:

1. Clean off all carbon from top of block and top of cylinders by scraping with a putty knife.

2. Clean off all dirt and grease from valve recess and inside crank case by washing with a damp kerosene rag (not dripping), and wipe clean and dry.

3. Clean the outside of the motor in the same manner.

4. Have a foreman check and credit you for this operation.

Questions:

1. Why not wash carbon off with kerosene?
2. Why is there a carbon ring around the top of the cylinder?
3. What other factor besides carbon may cause a ring around the top of the cylinders?

Text reference: ....

Assignment Sheet No. 23 — Reaming Valve Seats

Why this is done: For a valve face to seat tightly in place, the seat must be true and parallel to the face. Due to wear and pitting in the extreme heat of motor operation, seats must be reconditioned at regular intervals.

Procedure:

1. Select a reamer pilot that fits the valve guide and a reamer of the proper size and angle.

2. Place reamer on pilot and insert pilot in valve guide, lowering reamer carefully until it is resting on the seat.

CAUTION: Dropping the reamer will nick the seat and usually chip the reamer.

3. Attach handle to reamer and revolve slowly with a heavy, firm pressure until seat has been cut true and clean.

4. Use 15- and 75-deg. reamers to reduce width of seat and fit it to valve face.

NOTE: For best operation a valve seat should be about 3/32 in. wide.

5. Clean out valve seat and port, being careful to remove all cuttings from motor.

Questions:

1. How do we make sure the reamer will cut the seat true and parallel to the valve face?

2. How could you cut glaze off a valve seat if the reamer failed to start cutting?

3. What is the material in a reamer that will permit it to cut an iron block?

Text reference:

Chapter 3, pages 43–46.

Assignment Sheet No. 24 — Lapping in Valves

Why this is done: In order to perfect the fit of a newly ground valve face into a reamed seat, it is necessary to lap the two surfaces together with fine valve grinding compound.

Procedure:

1. Apply a thin film of grinding compound to the face of a newly ground valve.

2. Slip a weak coil spring on the valve stem, and place valve in its proper guide.

3. With a valve grinding tool in a small hand drill, depress the valve into its seat, and rotate it in alternate directions a *few turns,* letting the valve lift off its seat momentarily.

4. Check the seat by wiping off the compound carefully and examining the valve for a dull gray ring all around the face and as wide as the seat.

NOTE: Only a *very few turns* are necessary to finish the lapping process if the valve has been properly faced and seated.

Questions:

1. Why is lapping in necessary?

2. Why must the compound be cleaned off when through?

3. What would be the result of lapping a valve too long?

Text reference: ....

(To be continued)

AERONAUTICS

WILLIAM E. NAGEL

Assistant Professor of Engineering

University of Wichita

Wichita, Kans.

(Continued from page 285 of the September, 1948, issue)

UNIT IX
Avigation

I. Charts

A. Mercator projection is designed so that the meridians and parallels are represented by two sets of parallel lines at right angles to each other.

1. Meridians are same distance apart and do not converge.

2. Parallels of latitude are spaced at proportionately greater intervals.

3. Error between most northernly and southernly points in the United States is 40 per cent.

B. Lambert projection. Meridians and parallels are projected upon a cone which intersects the earth's surface at two standard parallels. U. S. is between 33 and 45.

1. Meridians are straight lines converging toward a common point.

2. Parallels of latitude are represented as arcs of concentric circles.

3. Error between points in the U. S. is ½ per cent, or only one-half mile in each 100 miles.

C. Chart reading

1. Symbols used on maps such as are shown on a sectional map.

II. Dead reckoning

A. Plane sailing. A method of finding the relation between the course, distance sailed or flown, and the corresponding N–S and E–W distances.

1. Distance (dist) is the hypotenuse of a right triangle.

$$\text{Tan } C = \frac{\text{Dep}}{\text{DL}}$$

2. Difference of latitude (DL). Meridian measures in nautical miles.

3. Departure. E–W distance measured on an arc of a parallel.

B. Parallel sailing. If a course is due east or west the following methods are used.

1. Dep difference of longitude x cos L.

2. Difference of longitude $= \frac{\text{Dep}}{\text{Cos L}}$

C. Middle latitude sailing. When the course between two points does not follow a parallel of latitude, the nautical miles of departure are converted to minutes of longitude by dividing by the cosine of the average of the two latitudes, that is, the middle latitude.

1. $\text{Tan } C = \frac{\text{Dep}}{\text{DL}} = \frac{\text{DLo x Cos Lm}}{\text{DL}}$

$$\text{Distance} = \frac{\text{Dep}}{\text{Sin C}}$$

2. Only useful up to 600-mile trips and cannot be used for courses crossing the equator.

D. Triangle of velocities. In air navigation it is important to know how to determine the effect of a wind of known velocity and direction on the course and speed of the plane. These factors are solved by using triangles to form a parallelogram.

1. The heading is the direction in which the plane is pointed. Determined by the compass.

2. The track is the direction of travel over the ground that the plane actually follows.

3. Airspeed is the speed which a plane has in calm air. (From air-speed indicator.)

4. Ground speed is the speed with which the plane is moving over the ground.

5. Drift angle is the angle between the heading and the track.

6. Wind is said to be from some direction — a north wind is a wind from 0 deg. blowing toward 180 deg.

E. The wind star. A graphic method of finding the heading for a required track from measurements of drift on two headings.

F. Interception. "Constant bearing means collision," and in air navigation "constant bearing means interception."

1. Used for meeting on patrol.

2. Intercept hostile aircraft or ships.

3. Return to a carrier after a flight.

G. Radius of action

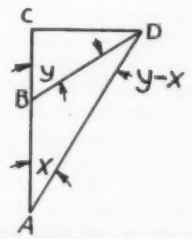
1. In returning to a fixed base, frequently it is necessary to determine how far a plane can fly from a given point and return in a fixed time. With no wind the "time out" would equal the "time in" but when there is a wind the ground speed on the outbound trip will be different than on the return flight. The distance is called radius of action which the plane could safely fly and can be determined from the difference in the ground speeds.

2. Returning to a moving base has a problem of a combination of the simple wind triangle and the problem of interception, or starting from one fixed base and returning to a second fixed base.

III. Piloting. Navigation used in getting to a destination by the use of landmarks and charts. Visible marks as used in reading an auto map.

A. Position of cross bearings. When it is possible to observe the bearings of two, three, or more objects which are indicated on the aeronatical charts, the position is found by plotting these bearing lines. The bearings do not determine a point but a very small triangle, the *cocked hat* or *triangle of error.* The accuracy of the fix depends upon the size of this triangle of error.

B. The position by two bearings. The position of a plane may be determined by two bearings of a single object obtained at different times. In the figure angles x and y are called angles on the bow. C is the distance at which the object is passed abeam and when y equals 2x, then BD equals AB and is called doubling the angle on the bow.



C. Three-point problem. An important method of fixing position is to measure the angle which the ship makes with three points. This method is to be avoided when circles have centers close together and this method cannot work when the two circles coincide. First used by Willebrand

Snell, a Dutch mathematician in 1617.

D. Danger angle. Another geometrical application used in sailing along a coast where reefs or other dangers are present.

IV. Celestial navigation

A. Measurement and correction for observed altitudes.

1. Marine sextant or bubble sextant are used for measuring altitude. Corrections to be observed are:
   a) index error
   b) dip or height of eye — only applicable to visible sea horizon and not to air navigation with the bubble sextant.
   c) Semidiameter — always use sun or moon's center. The bubble sextant automatically corrects. Lower edge of sun or moon is called *lower limb*.
   d) Refraction and parallax — earth's light rays are bent causing stars to appear higher than they are.

B. Latitude of meridian angle. The latitude of a plane may be determined by measuring the altitude of a star or other celestial body when it crosses the meridian.

$h = d + 90°$
$L = h + d - 90°$
$L = 11°11'S$

C. Latitudes from altitude of Polaris. Both nautical almanac and air almanac provide ways of finding the latitude from the north star. The longitude does not have to be exact as the local hour angle changes very slowly. May find the correct latitude from dead reckoning longitude.

1. Latitude is observed and corrected.
2. Approximate local hour angle (LHA) is found from the Greenwich hour angle (GHA) and the approximate longitude.
3. Table III gives corrections to add or subtract from the altitude to obtain the latitude.

D. Circle of position. One observation of altitude of a celestial body does not fix position. However, by finding the substellar point of this body a circle of position and the circle drawn through this substellar position will locate the plane.

E. Sumner line. If a navigator observed the altitudes of two stars at the same time and drew circles of position for each at one point of the intersections this would be the position. Small arcs of position circles are drawn already on a chart. These lines of position are called Sumner lines after T. H. Sumner who discovered this method in 1837. Unless the altitude is greater than 80 the arc of the position circle is drawn as a straight line. The Sumner line is plotted by calculating the latitude and the longitude of two points. The St. Hilaire method is now used (after Marc St. Hilaire, a French admiral).

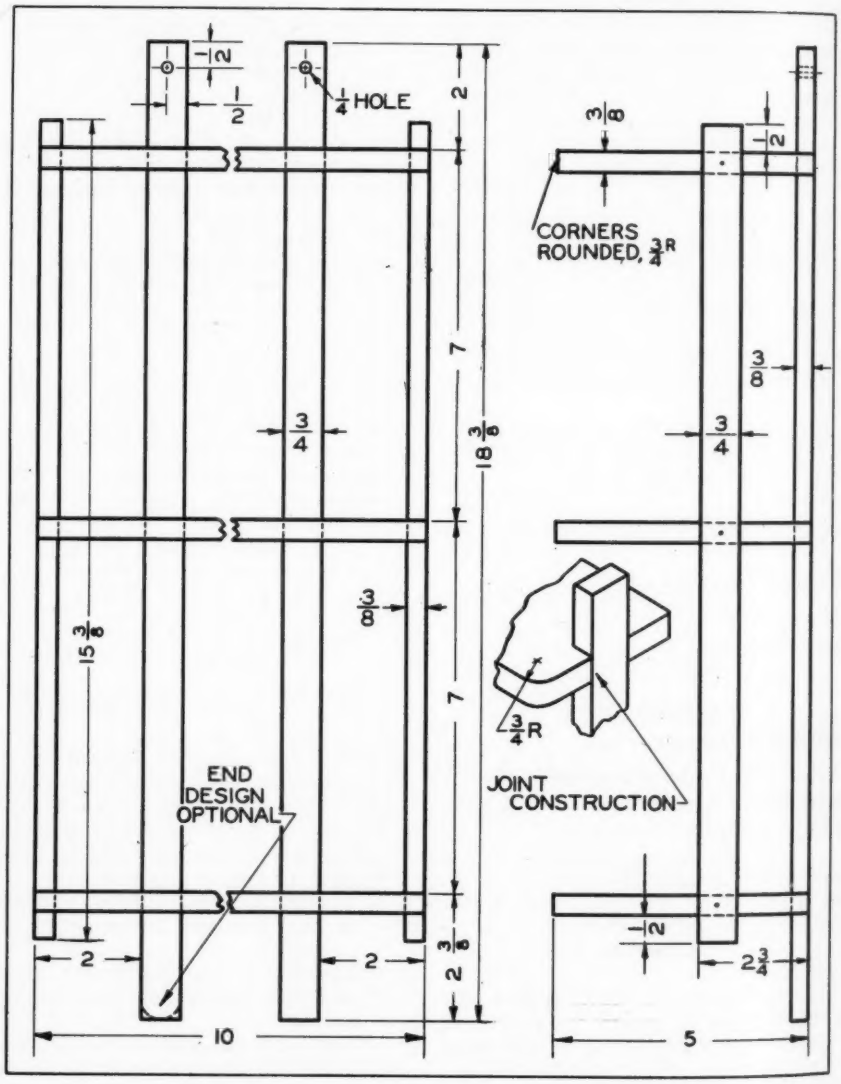
F. Altitude on the prime vertical. In plotting a Sumner line an altitude and azimuth must be calculated. The sun has to have a zenith in north latitudes. It is a line which passes from one point on the horizon to the zenith and then to a point on the horizon again and is called a prime vertical.

G. Position by Sumner lines. A position may be determined by two Sumner lines resulting from two simultaneous altitudes of different stars. In air navigation there will be a time interval between observations that will have to be considered.

(To be continued)

A CURE FOR PANICS

"Luminous" plastics or painted signs mark exits, fire escapes, stairways, and fire hose stations in hotels, theaters, and hospitals to help to evacuate people in the dark in the event of a fire or other emergency accompanied by power failure. — *The New Jersey Zinc Co.*



Simple wall shelf bracket. Submitted by Harry S. Baldwin, General Mercer School, Toronto, Ont., Can.

Students Learn *Faster* with

A SLIDEFILM LIBRARY FOR YOUR SHOP

A wide range of slidefilms, shop-tested and technically correct, is available for industrial education.

Visualization of the student's problems provides one of the most effective teaching tools known. Students see each problem clearly, and quickly grasp the solution shown in projected pictures.

Every lesson is covered thoroughly. Quick reviews and questions are used to stimulate class discussion.

Whether you enclose a check or order on approval, be sure you send this coupon now for these modern helps to modern teaching.

The JAM HANDY Organization

All Prices Plus Sales Tax Where Applicable

THE JAM HANDY ORGANIZATION, 2821 East Grand Blvd., Detroit 11, Michigan

Please enter my order for—

SLIDEFILMS

- ☐ BASIC SHOP SAFETY
  8 slidefilms $30.00
  Individual slidefilms 4.50
- ☐ WOODWORKING TOOLS AND MACHINES
  14 slidefilms $51.60
  Individual slidefilms 4.50
- ☐ ENGINE LATHE
  11 slidefilms $46.50
  Individual slidefilms 4.50
- ☐ TECHNICAL LETTERING
  5 slidefilms $18.00
  Individual slidefilms 3.75
- ☐ AUTOMOTIVE MECHANICS (kit 1)
  35 slidefilms $99.00
  Individual slidefilms 3.50
- ☐ AUTOMOTIVE MECHANICS (kit 2)
  35 slidefilms $99.00
  Individual slidefilms 3.50
- ☐ BENCH WORK
  10 slidefilms $39.50
  Individual slidefilms 4.50
- ☐ MACHINING
  16 slidefilms $53.50
  Individual slidefilms 4.50
- ☐ OXYACETYLENE WELDING
  15 slidefilms $41.50
  Individual slidefilms 3.75
- ☐ AIRCRAFT ENGINE MECHANICS
  24 slidefilms $69.00
  Individual slidefilms 3.50
- ☐ AIRCRAFT MECHANICS
  47 slidefilms $135.00
  Individual slidefilms 3.50
- ☐ AVIATION METALSMITHS
  16 slidefilms $45.75
  Individual slidefilms 3.50

MOTION PICTURES

- ☐ BEHIND THE SHOP DRAWING
  2 reel, 16 mm, safety stock with sound $66.00
- ☐ USE AND CARE OF HAND FILES
  2 reel, 16 mm, safety stock with sound $66.00
- ☐ HAND SAWING
  2 reel, 16 mm, safety stock with sound $66.00
- ☐ AIRCRAFT RIVETING
  Combination slidefilm and motion picture with sound
  2 reel, 16 mm, on safety stock ... $66.00
- ☐ OXYACETYLENE WELDING
  2 reel, 16 mm, safety stock with sound $66.00

Name_____ Position_____

Organization_____ Address_____

City_____ Zone_____ State_____

Prices F.O.B. Detroit—subject to change without notice. Write for further information about Jam Handy Films. These films may be purchased through a nationwide dealer organization.

INSTRUCTORS: For Your "Info" File

Ask for this Big, New { HACKSAW and BAND SAW BOOK

You'll find this data-packed book a practical up-to-the minute aid to class instruction. Ask your Starrett Distributor for it. He'll reserve a special free copy for you or use the handy coupon below to write for it today.

The L. S. STARRETT CO., Dept. CE
Athol, Massachusetts, U. S. A.

Please rush my free copy STARRETT HACKSAW and BAND SAW BOOK. Thanks.

Name_____

Company_____

Position_____

Address_____

STARRETT

MECHANICS' HAND MEASURING TOOLS AND PRECISION INSTRUMENTS · DIAL INDICATORS STEEL TAPES · HACKSAWS AND BAND SAWS PRECISION GROUND FLAT STOCK

Buy Through Your Distributor

Personal News

HERBERT S. CONRAD JOINS OFFICE OF EDUCATION AT WASHINGTON

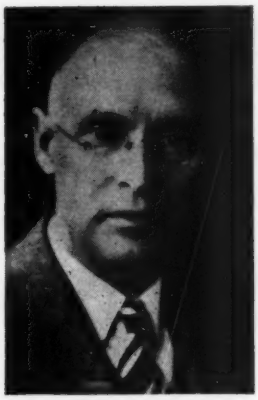
Herbert S. Conrad, of Princeton, N. J., has been appointed chief of the research and statistical service, Office of Education. Mr. Conrad will assume his new duties around October 18.

Mr. Conrad is author and coauthor of numerous publications and articles in the field of tests and measurements and of educational psychology. He received his A.B. degree from Columbia University in 1926, and his M.A. degree at the same institution in 1940. He obtained his Ph.D. from the University of California in 1931, and has performed additional graduate work there in education.

EDWARD F. RANDALL DIES

Edward F. Randall, 69, who during his career in the public school system in Kenosha, Wis., rose to the position of director of the Kenosha Vocational School, died July 28, 1948, following a long illness.

Mr. Randall came to Kenosha in 1906 to become the principal of the Bain School, and remained active in the local educational field until his retirement in 1944. His career in education brought him a life membership in the American Vocational Association, memberships in the National and Wisconsin Education Associations, and he became a 25-year member of the Wisconsin Association of Directors of Vocational and Adult Education in 1946.



Edward F. Randall

Mr. Randall was born at Darien, Wis., on November 9, 1878. In childhood he moved to Troy Center with his parents, and received his early education there.

He later attended Milwaukee Normal School, The Stout Institute, and Oshkosh Normal School. He taught school for a time at Troy Center and came to Kenosha in 1906. In 1912 he was appointed principal of the Frank School, and in 1916 he became principal of the Lincoln Junior High School. From 1918 to his retirement in 1944 he was principal of the Vocational School at Kenosha.

He is survived by his widow and two sons.

CHARLES W. SYLVESTER RECEIVES HONORARY DEGREE

Charles W. Sylvester, who has served as treasurer of the American Vocational Association for the past 25 years, was awarded the honorary

Charles W. Sylvester

degree of D.Sc. by his Alma Mater, the University of Maryland. Dr. Sylvester received this honor at the 40th anniversary reunion of his class at the University of Maryland.

IVAN HOSTETLER HEADS INDUSTRIAL-ARTS DEPARTMENT

Ivan Hostetler has been appointed head of the industrial-arts department of the North Carolina State College of Agriculture and Engineering of the University of North Carolina, Raleigh, N. C. He assumed the duties of his new position on August 2, 1948.

Mr. Hostetler received his A.B. degree from Bluffton College, Ohio; the M.A. degree from Ohio State University; and the Ed.D. degree from the University of Missouri.

(Continued on page 16A)

START YOUR STUDENTS ON ALUMINUM PROJECTS NOW!

PICTURED HERE are some prize winners in the annual Aluminum Projects Competition for 1947-48. Note the original designs, the professional-like workmanship of these prize-winning projects. You teachers deserve much credit for your individual help and inspiration that enabled 54 students to walk off with cash prizes in this contest conducted by Scholastic Magazines, sponsored by ALCOA.

NOW . . . TRY AGAIN! Start your students on their new aluminum projects. 54 cash prizes will be offered again in the 1948-49 Aluminum Projects Competition that gives your students an added incentive for doing better shopwork . . . creates greater interest in their work. They will find it's fun to work with aluminum—good experience, too. The field of selection is wide open . . . aluminum is available in many forms, and lends itself to every metal-working method.

YOU HAVE 54 CHANCES TO WIN CASH—Identical awards listed below will be given for two classes of aluminum projects:

WROUGHT ALUMINUM—any project made of sheet aluminum (including rod, tube, and bar) in which aluminum is the major material of construction; hammered, overlaid, etched, stamped, sawed, spun, or other method of handling.

CAST ALUMINUM—any project in which cast aluminum is the major material of construction. Projects must be finished for use. Examples: Book ends, ash trays, name plates, lamp bases, candlesticks, smoking stands, lathe parts, drill press parts.

GROUP CLASSIFICATIONS: Group I: Students in Grades 7 and 8 whether in an elementary, junior, or general four-year high school. Group II: Students in Grades 9 and 10 who receive instruction for less than 10 clock hours per week in industrial arts. Group III: Students in Grades 11 and 12 who receive instruction for less than 10 clock hours per week in industrial arts. Group IV: Students in vocational, trade and industrial, and technical high schools who spend 10 or more clock hours per week in shop, laboratory, or drawing room receiving instructions in the subject represented by the entry.

PRIZES—*Wrought* Aluminum: Prizes for Groups I, II and III. First, $50; second, $25; third, $10; six honorable mentions of $5 each, for each group. *Cast* Aluminum: Prizes for Groups II, III and IV. First, $50; second, $25; third, $10; six honorable mentions of $5 each, for each group. Teachers, for rules, write to: SCHOLASTIC ARTS AWARDS, 220 East 42nd Street, New York 17, New York.

FREE!

FORMING ALCOA ALUMINUM: 56 pages; 20 illustrations. Explains the fabrication of aluminum and magnesium by blanking, and piercing, drawing, spinning, shape forming, embossing, coining and stamping. Write for your free copy to ALUMINUM COMPANY OF AMERICA, 1772 Gulf Building, Pittsburgh 19, Pennsylvania.

FREE!

CASTING ALCOA ALLOYS: 94 pages; 22 illustrations. General foundry principles, including melting, molding and finishing. A complete description of the various aluminum casting alloys is listed in convenient form. Write for your free copy to ALUMINUM COMPANY OF AMERICA, 1773 Gulf Bldg., Pittsburgh 19, Pa.

ALCOA FIRST IN ALUMINUM

ALCOA ® ALUMINUM 1888 1948 60 YEARS OF SERVICE

For Woodworking Projects

PAXTON LUMBER

MEETS ALL REQUIREMENTS

Besides selling lumber and plywood, we must sell confidence. That has been our aim in the many years we have been supplying industrial arts shops. Paxton products are not always the lowest in price but we strive to make them the best.

Considering the small quantity required for the average industrial arts projects, materials of doubtful quality offer the individual student only slight savings. Isn't it false economy to save a few cents on his lumber at the risk of having his project turn out badly?

As in the past, we shall continue to supply lumber and plywood of the highest quality obtainable, measured and graded in the best interpretation of current national grading rules. Our reputation is back of everything you purchase from us, and we shall continue to do our best to merit your confidence.

FRANK PAXTON LUMBER COMPANY

ESTABLISHED 1911

Specialists in Industrial Arts Lumber and Plywood

WRITE TO YARD NEAREST YOU FOR FREE CATALOG

Offices and Yards at:
Chicago, Illinois — 5701 W. 66th Street
Denver, Colorado — P.O. Box 1676
Des Moines, Iowa — P.O. Box 683
Fort Worth, Texas — P.O. Box 1225
Kansas City, Kansas — Packers Station

(Continued from page 14A)

His teaching experience embraces nine years in the public schools of Ohio, of which four were as principal of a school. He was professor of industrial-arts education at Georgia Teachers College for eight years, and chairman of the division of fine and practical arts for three years. At the University of Missouri he was instructor of industrial arts for one year. During the war he was foreman in the Pratt & Whitney Aircraft Training School at Kansas City for three years.

He has written for the *American School Board Journal*, the INDUSTRIAL ARTS AND VOCATIONAL EDUCATION magazine, and the *American Vocational Association Journal*.

He was president of the Georgia Industrial Arts Association, vice-president of the Georgia Vocational Association, and holds membership in the N.E.A., Georgia Education Association, Georgia Vocational Association, Georgia Industrial Arts Association, Phi Delta Kappa, and Epsilon Pi Tau.

♦ M. RAY KARNES completed the work for his doctor's degree in industrial education at the University of Missouri in June, and has gone to the University of Illinois as an assistant professor of industrial education. Dr. Karnes wrote his dissertation on "Evolving Concepts of Industrial Education in the Thinking of Organized Labor." For two years he was a regular member of the University of Missouri staff.

♦ EMERSON WILLIAM MANZER has accepted a position at Platteville State College, Platteville, Wis., as instructor of industrial arts.

♦ CHARLES THOMAS GOVIN recently received the M.A. degree from the University of Minnesota, Minneapolis, Minn.

♦ GEORGE A. SODERBERG, instructor in painting and decorating at The Stout Institute, Menomonie, Wis., recently received the M.A. degree from the University of Minnesota, Minneapolis, Minn.

♦ H. C. FETTEROLF, vice-president of the American Vocational Association for agricultural education, has been sent by the U. S. War Department to study vocational agricultural programs in Japan and Korea. He left on this mission from Washington, D. C., on July 1, and is based at Seoul, Korea.

ELECTED CHAIRMAN OF STATE APPRENTICESHIP COUNCIL

Howard A. Campion, assistant superintendent of schools, Los Angeles, Calif., has recently been elected chairman of the Apprenticeship Council of the state of California.

H. A. Campion

He received his appointment to the council as public representative by the governor of California. The election to the chairmanship is a special honor to Mr. Campion, since heretofore, the office has alternated between labor and management.

Association News

♦ G. Harold Silvius, president of the National Association of Industrial Teacher Trainers, submits the following program for the convention to be held at Milwaukee, Wis., on November 28, 29, and 30.

Sunday, November 28, 7:00 p.m.

Topic: *Research Projects in the National Association of Industrial Teacher Trainers*

Chairman: Eugene D. Fink, Chief, Bureau of Vocational Curriculum Development and Industrial Teacher Training, The University of the State of New York, Albany, N. Y.

"Current Research in Industrial Education" — C. Kenneth Beach, Professor of Industrial Education, Cornell University, Ithaca, N. Y.

"Occupational Opportunities for Young Men in Industrial Education" — Aldred B. Turner, Chairman, Teacher Training Department, Hampton Institute, Hampton, Virginia.

Panel Discussion — "Preparing Industrial Education Teachers to Teach Accident Prevention"

Members of Panel

DeWitt Hunt, Chairman of the Division of Industrial Arts Education and Enginering Shop Work at Oklahoma A and M College, Stillwater, Okla. (Chairman); R. B. Blake, U. S. Department of Labor, Washington, D. C.; Gordon Graham, Supervisor of Safety Education, Detroit Public Schools, Detroit, Mich.; Wayne P. Hughes, Director, College Division, National Safety Council,

(Continued on page 18A)

Centuries attend this moment...

. . . this moment when the woodsman's ax does what no other force could do—fells the Mahogany tree.

Centuries past have set the stage . . . have put the growing tree to every test of strength and durability.

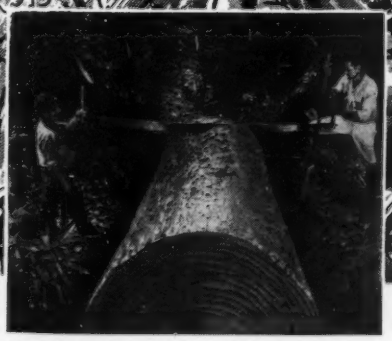
And centuries to come will commemorate this moment, in furniture that lives till—who can say? The earliest Mahogany piece known is still in perfect condition.

Yes, the years only add to the mellow warmth of genuine Mahogany . . . add to its reputation for strength and durability. Craftsmen still marvel at its workability, even as the masters of old.

Timeless, too, is the *preference* for Mahogany. Whatever the period, whatever the style, genuine Mahogany is the most wanted of cabinet woods.

Fortunately, this demand is now being met with ever-growing supplies. Ask for genuine Mahogany in the furniture you display . . . let customers know *you have the finest.*

"Mahogany—Wood of the Ages, Yesterday—Today—Tomorrow." 16 mm color-sound story of Mahogany from its jungle home to the finished product. Bookings made on a selective basis according to size of school audience.



SECRETS BARED . . . the tree is down, and now the saw reveals the first clues to the pattern of the grain. Always different, yet always beautiful, genuine Mahogany shows the greatest variety of all cabinet woods.

"After All . . . there's nothing like MAHOGANY"

MAHOGANY

MAHOGANY ASSOCIATION, INC.

Suite 804-A, 75 East Wacker Drive
Chicago 1, Illinois

Please send new 7th edition of the 74-page Mahogany Book.

Name.....

Address.....

City and Zone No.....

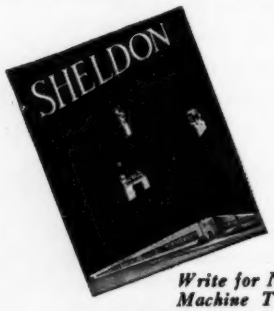
State.....

SHELDON

TU-S56 PRECISION LATHES

• No other type bearing can stand abuse like a tapered roller bearing. That is why roller bearing lathes are most practical for school shops.

"Zero Precision" taper roller spindle bearings are only one of the important "school features" of the SHELDON TU-S56 school lathe. Others include:



Permanent Accuracy without constant servicing

Features

Safety	**Fully enclosed headstock and drive. (All speed changes are made by outside levers.)**
Capacity	**11¼" Swing, 1" Collet Capacity, 56" Bed.**
Practicality	**Standard big lathe design, controls and features.**
Welded Bench	**With 3 independently locking drawers for students aprons, micrometers, and work.**
Moderate Price	**Built in a modern specially tooled plant with the finest most modern equipment this quality lathe can be sold at a moderate price.**

Write for New G-48 Catalog showing full line of Sheldon Machine Tools including new low priced L-44 Lathes.

SHELDON MACHINE CO. Inc.

Manufacturers of Sheldon Precision Lathes • Milling Machines • Shapers

4244 N. KNOX AVENUE • CHICAGO 41, ILLINOIS, U. S. A.

(Continued from page 16A)

Chicago, Ill.; John Roche, Manager, Industrial Department, National Safety Council, Chicago, Ill.; Edward M. Roden, Industrial Teacher Trainer, Danforth School, 220 W. Kennedy Street, Syracuse 5, N. Y.; Homer J. Smith, Chairman of the Department of Industrial Education, University of Minnesota; Ray M. Stombaugh, Head, Department of Industrial Arts Education, State Normal University, Normal, Ill.; Sylvan A. Yager, Chairman, Department of Industrial Arts and Industry, Indiana State Teachers College, Terre Haute, Ind.

Monday, November 29, 9:00 a.m.

The Joint Meeting of the National Association of State Supervisors of Trade and Industrial Education and the National Association of Industrial Teacher Trainers.

Co-Chairmen: Merritt W. Haynes, State Teacher Trainer, Trade and Industrial Education, State Department of Education, Mercer University, Macon, Ga.; and Harold J. Van Westrienen, Chief, Trade and Industrial Education, State Board of Control for Vocational Education, Lansing, Mich.

"What Part Will Industrial Education Play in Compulsory Military Training"—L. H. Dennis, Executive Secretary of the American Vocational Association, Washington, D. C.

"Teacher Training for Technical Education"—Andrew D. Althouse, Supervisor of Vocational Education, Detroit Public Schools; and Co-operating Faculty, Wayne University, Detroit.

"Trade Competency Tests"—Paul V. Lofgren, Supervisor in Charge of Testing, University of California, Berkeley, Calif.

"Related Instruction for Apprentices"—Arthur B. Wrigley, State Supervisor of Trade and Industrial Education, Trenton, N. J.

"An Exhibit of Visuals Developed by Teachers in Teacher Training Classes"—M. L. Barlow, T. and I. Teacher Trainer, University of California, Los Angeles, Calif.

Monday, November 29, 2:00 p.m.

Topic: Industrial Teacher Education

Chairman: Thomas A. Hippaka, Professor of Industrial Education, Iowa State College, Ames, Iowa

"Visuals for Industrial Teacher Education"—A. P. Twogood, Professor of Vocational Education, Iowa State College, Ames, Iowa; and William J. Micheels, Associate Professor of Industrial Education, University of Minnesota, Minneapolis, Minn.

"A College Cooperative Curriculum for Auto-Mechanics Teachers"—M. D. Darrow, Associate Professor and Teacher Trainer, Texas A. and M. College, College Station, Tex.; and Gerald Baysinger, Department of Industrial Education, Wayne University, Detroit, Mich.

"Itinerent Training for Apprentice Teachers"—A. A. Vezzani, Teacher Trainer, University of Michigan, Rackham Extension Building, Detroit, Mich.

Tuesday, November 30, 1948, 12:00 noon

National Association of Industrial Teacher Trainer Luncheon Meeting

Chairman: Charles Crumpton, Professor of Industrial Education, University of Kentucky, Lexington, Ky.

12:00–1.00 Luncheon

1:00–1:20 *Membership in the National Association of Industrial Teacher Trainers*—Willard Bateson, Director of the Curriculum Laboratory, University High School, University of Michigan, Ann Arbor, Mich.

1:20–2:20 *Business Meeting* — President, G. Harold Silvius, Chairman, Department of Industrial Education, Wayne University, Detroit, Mich.

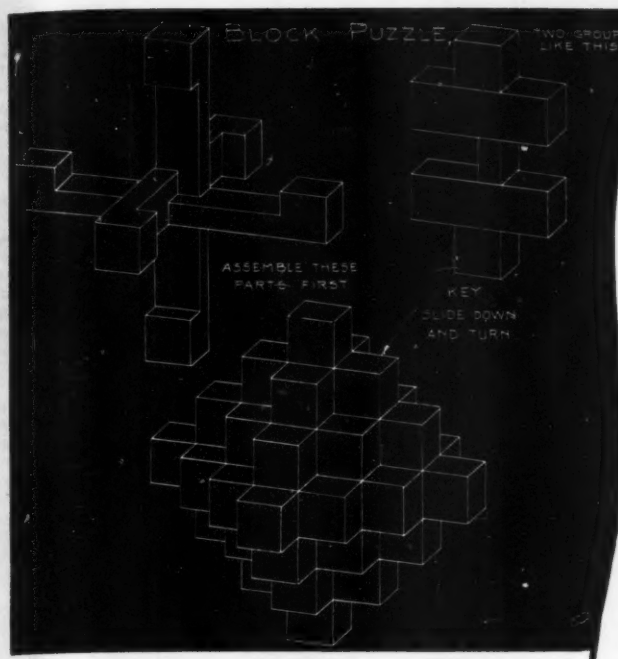
2:20–2:30 *The Induction of Officers*—Clyde H. Wilson, Professor of Industrial Education, University of Tennessee, Knoxville, Tenn.

♦ R. F. Thomas, registrar, University of Tennessee, Knoxville, Tenn., has been elected president of the American Association of Collegiate Registrars at the annual meeting of the Association in Philadelphia on April 19 to 22, 1948. Other officers elected by the AACR include R. E. McWhinnie, first vice-president, and Mrs. Gretchen M. Happ, second vice-president. Mr. McWhinnie is registrar of the University of Wyoming, Laramie, Wyo., and Mrs. Happ is registrar of The Principia College, Elsah, Ill.

Other officers of the AACR serving on the executive committee include Carrie Mae Probst, registrar, Goucher College, Baltimore, Md., as past president; A. F. Scribner, registrar, Valparaiso University, Valparaiso, Ind., as treasurer; W. C. Smyser, registrar, Miami University, Oxford, Ohio, as editor of *College and University*, the journal of the AACR; W. P. Clement, registrar, Texas Technological College, Lubbock, Tex., as chairman of the Committee on Special Projects; R. C. Linton, registrar, Michigan State College, East Lansing, Mich., as chairman of the Committee on Regional Associations; and G. E. Metz, registrar, Clemson Agricultural College, Clemson, S. C., as secretary.

♦ After four years of meeting under the title of National Conference of Schools of Design, the following professional nonprofit making art schools and art departments of colleges and universities adopted a constitution in Kansas City, Mo., the new organization to be known as the National Association of Schools of Design. This new Association was established June 18, 1948, with the following institutions constituting charter membership: Akron Art Institute, Akron, Ohio; Alabama Polytechnic Institute (Dept. of Art) Auburn, Ala.; Carnegie Institute of Technology, Pittsburgh, Pa.; Cincinnati, University of (College of Applied Arts), Cincinnati, Ohio; Cooper Union Art School, New York, N. Y.; Illinois, University of (College of Fine and Applied Arts), Urbana,

(Continued on page 20A)



Write to the address below, if you are not already receiving these problems. We'll gladly place your name on our mailing list.

Christmas Gift Puzzle . . .

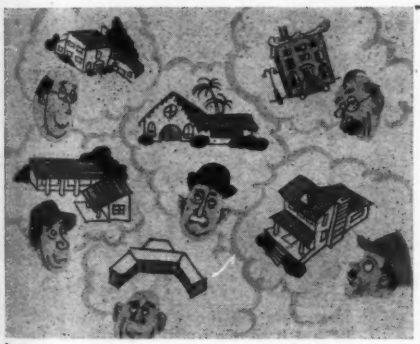
another practical teaching help in the Eldorado Problem & Solution Service series for shop and drawing students . . . one they can easily finish for a Christmas gift.

For dimension drawings of this puzzle, write to the address below for Eldoradostats of both problem and solution. From them you can make as many blueprints as you need to start your students drawing the correct orthographic views and constructing this problem.

And have them begin with Dixon's *Typhonite* Eldorado drawing pencils. The draftsman used Eldorado degrees 2H and 3H for this drawing. Your students should do likewise.

DIXON'S TYPHONITE ELDORADO

SCHOOL BUREAU, PENCIL SALES DEPT., 128-J11, JOSEPH DIXON CRUCIBLE CO., JERSEY CITY 3, N. J.



HOW WELL DO YOUR STUDENTS UNDERSTAND THE LANGUAGE OF DRAWING?

Do your students of mechanical drawing have a clear understanding of the importance of this universal language of the manufacturing and construction trades? Have you been able to convince them of the necessity of a firm grasp of the fundamentals of this language? Are there, perhaps, certain aspects of theory with which they have particular difficulty?

McGraw-Hill Text-Films on Mechanical Drawing have been produced with the specific aims of helping the teacher to meet such difficulties and of convincing students of the importance of the subject.

Film coverage was determined by a representative group of Mechanical Drawing teachers, who selected the subjects most difficult for students in general. The series consists of sound motion pictures and follow-up silent filmstrips, correlated directly with specific chapters of *Mechanical Drawing* by French and Svensen. When used in conjunction with the textbook, the films provide a powerful visual stimulus which is reflected in more efficient learning and long-term retention of material.

Glance at the list of motion picture titles in this series: We believe you will be convinced that McGraw-Hill Text-Films on Mechanical Drawing will provide complete subject matter coverage for your classes. Then write us for Booklet "O". It will bring you more information.

1. The Language of Drawing
2. Shape Description — Part I
3. Shape Description — Part II
4. Sections
5. Shop Procedures
6. Auxiliary Views — Part I
7. Auxiliary Views — Part II
8. Size Description

McGraw-Hill Book Company, Inc.
TEXT-FILM DEPARTMENT
330 West 42nd Street
New York 18, N. Y.

McGRAW-HILL TEXT-FILMS

Painless

Safety Education

A practical plan of proven value

SAFE WORK PRACTICE IN SHEET METAL WORK

by

Silvius-Baysinger

This new addition to your individualized safety program attractively presents preventive safety instruction for the regular sheet metal course, as well as for aircraft sheet metal, metal spinning, and art metal. A complete "before-going-to-work" test gives the instructor reasonable assurance that accidents will not occur. Price, 60 cents

SAFE WORK PRACTICE IN WOODWORKING

by

Silvius-Baysinger

The well-illustrated and clearly written safety material in this practical handbook is arranged for easy integration with the instructional program. Produced in compact pocket form so that it will always be available as a guide to safety practices. Price, 60 cents

A GOOD MECHANIC SELDOM GETS HURT

by

Herman Gramon

A ready reference to the safety precautions necessary in operating each machine. This tested material has proved its value in hundreds of shops. Attractively illustrated and bound in pocket size.

Order your examination copy today

Att.: Department W331

Gentlemen:

Please send the books listed below on 30 days examination, subject to the educational discount.

.....Safe Work Practice in Sheet Metal Work

.....Safe Work Practice in Woodworking

.....A Good Mechanic Seldom Gets Hurt

Name.....

School.....

School Address.....

City.....Zone.....State.....

AMERICAN TECHNICAL SOCIETY

Publishers Since 1898

DREXEL AVENUE AT 58th STREET
CHICAGO 37, ILLINOIS

(Continued from page 18A)

Ill.; Kansas City Art Institute and School of Design, Kansas City, Mo.; Massachusetts School of Art, Boston, Mass.; Minneapolis Art School, Minneapolis, Minn.; Moore Institute of Art, Philadelphia, Pa.; Rhode Island School of Design, Providence, R. I.; School of Industrial Art, Philadelphia, Pa.; Syracuse University (School of Art), Syracuse, N. Y.; Washington University (School of Fine Arts), St. Louis, Mo.

The object of the organization is to develop a closer relationship among schools of design for the purpose of examining and improving their educational practices and professional standards in design. Eligibility for membership necessitates that the school be organized on a nonprofit basis established for the purpose of educating designers in the visual arts and giving evidence of permanence and stability; possessing an approved organization, administration, faculty, and facilities; and maintaining standards agreed upon by the Association.

The following officers were elected for the ensuing year: Dr. Royal B. Farnum, professional consultant for Cooper Union Art School, president; Ernest Pickering, Dean, School of Applied Arts, University of Cincinnati, Ohio, vice-president; Gordon L. Reynolds, president, Massachusetts School of Art, Boston, Mass., secretary; Dana P. Vaughan, dean, Cooper Union Art School, New York City, acting treasurer.

♦ Undergraduate students in the industrial-arts department at the University of Minnesota, Duluth Branch, recently organized Sigma Iota Epsilon, a fraternity composed of industrial-arts majors.

Some of the objectives of this fraternity are:

1. To promote fraternal relations within the department.
2. To promote greater understanding and greater interest in the field.
3. To promote character, craftsmanship, and scholarship within the membership.
4. To provide a basis for co-operation with similar local, state, and national organizations.

Officers for the 1948–49 school year consist of: president, George Wallin; vice-president, Walter Schmid; secretary. Robert White; treasurer, Robert Lehman. Faculty advisers are Frank Kovach and Gordon Voss.

Questions and Answers

ARCHITECTURAL MODELS

1133. Q.: Where can information on building architectural models be obtained? — *H.C.*

A.: Articles on building architectural models which have appeared in past issues of INDUSTRIAL ARTS AND VOCATIONAL EDUCATION are:

Model Interiors, January, 1932, p. 16

Interesting Contest in Miniature House Building, May, 1920, p. 199

Building a Miniature Bungalow, March, 1923, p. 122

Architectural Models, October, 1940, p. 340; November, 1941, p. 388; February, 1942, p. 74

Egyptian House Model, December, 1941, p. 435

Architectural Model Making, February, 1943, p. 72

Model House for the General Drawing Class, October, 1943, p. 330

Model Home Construction, February, 1932, p. 65

Most of the above material is out of print, but back copies of the magazine may be found at the superintendent's office, or in the high school library, or at a near-by teachers college. — *J. J. M.*

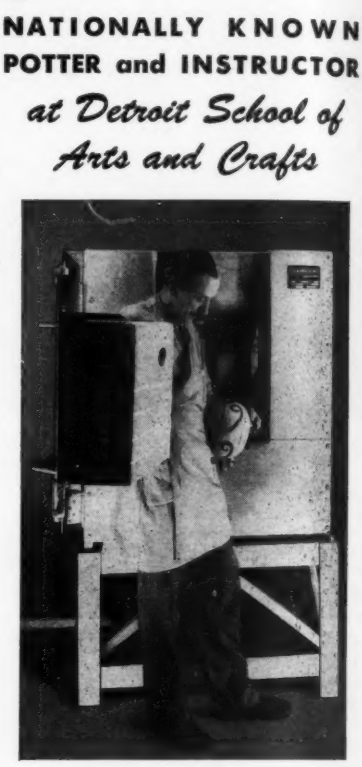
CASTING WITH KEENE CEMENT

1134. Q.: I have been working with Keene Cement for two or three years. Everything goes well until I cast a mold that is closed on all

. . . and John A. Foster

NATIONALLY KNOWN POTTER and INSTRUCTOR

at Detroit School of Arts and Crafts



Approves

ELECTRIC KILNS

Says Mr. Foster: "After two years of continuous service firing in the temperature range of 2400°F without Globar replacement or any other kiln maintenance cost, we feel that a wise choice was made in selecting the Harper Kiln for our school's advanced ceramic work. The very few adjustments necessary in carrying out a given firing schedule and the automatic shut-off control equipment are an important time saving factor for the instructor."

Write for informative data sheets covering America's most complete line of Globar-Equipped Electric Kilns. Periodic and Tunnel Kilns for every requirement.

HARPER ELECTRIC FURNACE CORP.

1445 Buffalo Avenue — Niagara Falls, N. Y.

Representatives in all principal cities

except one end, such as lampstands, candlesticks, etc. They come out of the mold deeply checked or cracked in one or more places. Usually they are too badly broken to be usable. I have tried a variety of mixtures and methods of settling these, from jarring to gentle vibrating. None seem to answer the purpose. I have *Keene Cement Craft* by Radtke, but have not found the answer there.

Can you give me suggestions as to my trouble or tell me where I can find the answer. — *R. H. S.*

A.: In answer to your request for information about Keene's Cement, I quote from the manufacturers, "Gypsum Plaster will never crack or loosen of itself." The only source of defect is, therefore, caused by some outside influence. It may be "dry out." This means that the water has been evaporated or absorbed by the mold, before the cement has had time to set.

To prevent the defect then, try placing the mold with the cast cement in a cool, damp place or where it can dry slowly. Be sure that the mold has been varnished and greased or soaked in oil before casting. Wipe out surplus oil.

Too quick set may be due to chemicals in the water, alkali, alum, or filtration water system.

Remedy — a retarder may be used. These may be purchased from the manufacturers of Keene's Cement. Add about one tablespoonful of liquid glue to the water used to mix the cement (approximately two spoonfuls to a gallon of water).

The water used in cement work should be clean and pure, free from alkali. Should the water contain alkali it may be neutralized.

Keene's Cement has a very low rate of expansion, and, if a dry dowel or wood plug is inserted into the wet cement, swelling as the wood absorbs the moisture may crack the piece. If possible use a piece of clay to make a recess to insert the wood plug for turning later.

Keene's Cement comes in three grades — quick set or casting, regular, and scagliola. Experience has shown that for projects listed the regular has proved best. It sets hard, takes a good polish, and though it has more pinholes, these can be easily filled with cement applied with a flat stick.

I hope this information will enable the enquirer to successfully cast Keene's Cement projects. We have been making projects of Keene's Cement using filtered water from the Milwaukee water system and have never had a project crack. —*O. A. R.*

News Notes

♦ W. C. Van Cleaf, director of industrial relations, Allis Chalmers Co., West Allis, Wis., announces that 2080 hours of credit be given to graduates of either the junior engineering division, or of the trade high school division of the Milwaukee Boys' Technical High School, Milwaukee, Wis., who enter into an apprenticeship contract with the firm.

♦ William F. Patterson, director, Bureau of Apprenticeship, U. S. Department of Labor, advises that apprenticeship standards should improve the selection of applicants for apprenticeship, the indenturing and getting indentures registered with the proper state or federal agencies as soon as possible, the job training in all of the skills of a trade, in adjusting differences between apprentices and employers or unions, and in determining how much credit toward the term of completion should be allowed.

♦ Indian educators, under the direction of Education Minister Maulana Abul Kalam Azad, are to concentrate in the first year of India's independence on the preparation of a blueprint of the new educational edifice.

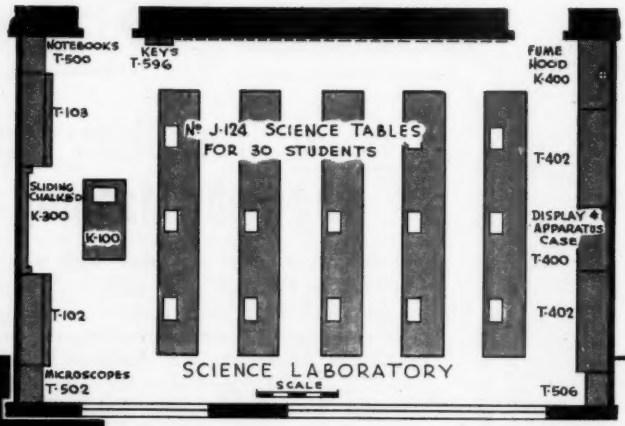
The activities of the Ministry of Education were impeded by the troubles that followed partition and independence. Originally scheduled to meet in June, 1947, the All-India Educational

Announcing
The Shop Scoop of '48
for Professional-looking Projects
DURITE
ADALOX
2 New Speed-Grits Sanders
by Behr-Manning
Here are two efficient new shop tools which combine everything "in the book" that spells professional-looking projects: First — the instant appeal of true usefulness — practical, foolproof, camera-type magazine-loaded hand sanders for finishing wood, furniture, plaster, metal, plastics, or paint. Second — the assurance of good functional design — the true flat resilient neoprene contact pad, securely cemented to the indestructible plastic body, produces infinitely better finishes than old-fashioned hand-sanding. Third — choice of 2 sizes, #12, with a sanding area of about 7" x 2", and #6, 5" x 1⅜". They are made in five rich colors — red, blue, yellow, green, and black.
These smart new Sanders are a "must" for every well-equipped school shop — and they're reasonably priced too — $1.25 for #12, and $1.00 for #6. Ask your distributor to include Speed-Grits Sanders in your next order.
BEHR-MANNING · TROY, N. Y.
NORTON ABRASIVES
QUALITY ABRASIVES SINCE 1872

NOT 24...BUT 30 STUDENTS

are accommodated efficiently in this Sheldon planned and Sheldon furnished Science Room.

In this multi-purpose table Sheldon has incorporated all features necessary to serve the four high school science courses . . . a table built to withstand long, hard usage. It is a table built to instructors' specifications — evidence of Sheldon's close cooperation with the nation's schools to supply furnishings in keeping with modern trends in education.



E. H. Sheldon & COMPANY

World's Largest Exclusive Manufacturer of Laboratory and Vocational Furniture

MUSKEGON, MICHIGAN

Conference, representing Provincial Ministers, University Vice-Chancellors, Provincial Directors of Public Instruction, and other educators, met finally in January, 1948.

The greatest task of the Ministry of Education was to plan ways and means to wipe out illiteracy which impeded progress and kept 85 per cent of a free people in ignorance. India's Education Adviser, Sir John Sargent, in 1945 had recommended a period of forty years in which to achieve this object. But the All-India Educational Conference resolved that this period must be substantially reduced.

♦ Secretary of Labor Maurice J. Tobin scheduled a public hearing in Washington for November 9 to consider an order which would declare certain occupations involving the operation of power-driven cold-metal-working machines as hazardous, thus setting 18 years as the minimum age for such employment within the child-labor provisions of the Fair Labor Standards Act.

Under terms of the proposed order, the minimum age for employment of minors would be raised from 16 years to 18 years for occupations as operator or helper on certain specified machine tools and on all forming, punching, and shearing machines which are used or designed for working on cold metal. The order would not apply to machines used or designed for working exclusively on hot metal.

♦ The number of registered apprentices in four major machining trades increased 50 per cent over a 12-month period.

The total number of machinist, tool- and die-maker, auto mechanic and airplane mechanic apprentices listed with the Federal Committee on Apprenticeship or a State Apprenticeship Council increased from 36,200 on July 1, 1947, to 54,500 on July 1, 1948.

The gains made in the four crafts are approximately the same. On July 1 of this year there were 16,800 machinist apprentices, 22,300 auto-mechanic apprentices, 13,800 tool- and diemakers, and 1600 airplane mechanics.

♦ A new Occupational Abstract which surveys prospects in the field of upholstery has just been published. Written by H. Alan Robinson, this pamphlet is available from Occupational Index, Inc., New York University, New York 3, N. Y., for 50 cents, cash with order.

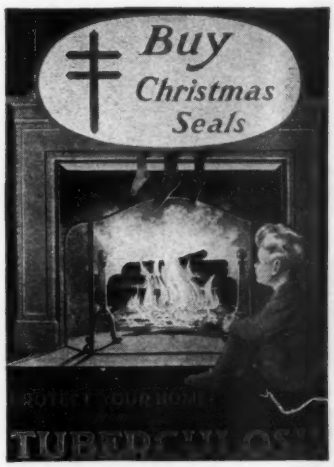
♦ School Savings in Action, a new, attractively illustrated guidebook of simple, easy-to-follow directions for operating a school savings program, is now available from the Savings Bonds Division in each state. The booklet is intended for teachers and school administrators who are re-installing school savings programs, and for those who wish to increase student participation in existing programs. Single copies may be requested from the Savings Bonds Office in each state or from the Education Section, U. S. Savings Bonds Division, Treasury Department, Washington 25, D. C., free.

♦ "School Bus Maintenance," is a guide to assist school administrators in planning and improving bus maintenance programs. It is based on practical experience in pupil transportation and outlines procedures and standards and furnishes recommendations on personnel, garage facilities, and garage equipment.

Practical recommendations reflect the combined experience of members of the Advisory Committee on School Bus Maintenance and of 175 operators of school bus garages in 15 states.*

Copies of "School Bus Maintenance" (Bulletin 1948, No. 2) are on sale for 15 cents a copy by Superintendent of Documents, U. S. Government Printing Office, Washington, 25, D. C.

*Alabama, Florida, Georgia, Iowa, Michigan, Minnesota, Mississippi, New York, Pennsylvania, Virginia, North Carolina, Tennessee, Ohio, Utah, and Washington.



New Publications

Aircraft Engines

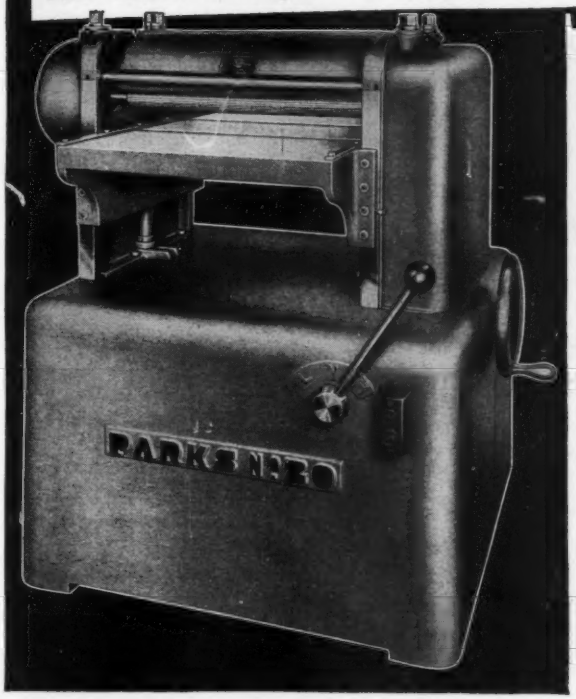
By Col. R. H. Drake. Cloth, 348 pp., 6¼ by 9½ in., illus., $5.90. Macmillan Co., New York. N. Y.

A book written for the layman, teacher, and airplane mechanic to explain the fundamentals of structure and the theory and operation of aircraft engines.

The 22 chapters of the book explain the fundamentals of internal combustion engines, the metals used in making these engines, a glossary of terms, types of engines, cylinders, pistons, crankshafts, crank cases, valves and cams, electrical funda-

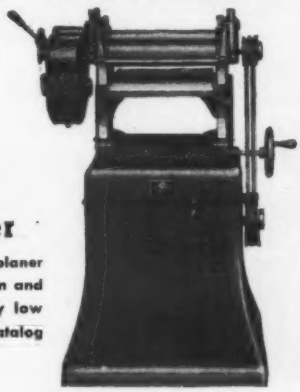
(Continued on page 24A)

The Sensationally NEW Low-Priced



PARKS No. 20
20" PLANER

Here is a modernly designed, rugged, high-speed, low-priced planer that is ideally suited for every shop and industrial plant requiring a quality surfacer. The Parks No. 20 Planer has a four-knife cutterhead with a speed of 3600 R.P.M. and offers two feed speeds — 20 and 40 F.P.M., and 40 and 80 F.P.M. Write for complete descriptive literature.



The PARKS Heavy-Duty 12" x 4" Planer

A compact, sturdy, thickness planer that offers mill planer precision and ruggedness at a sensationally low price. Write for descriptive catalog sheet.

The PARKS WOODWORKING MACHINE CO., Dept. 22P, 1546 Knowlton St., Cincinnati 23, O.

LEARN RIGHT WITH RIDER!

Television 'HOW IT WORKS'

Just out. Here is *practical* theory on the biggest development since the introduction of radio. Deals with transmission and reception of television signals, giving clear overall picture. Goes into frequency standards, antennas, and describes the various portions of a television receiver. Covers alignment and servicing. This book is part of Vol. 1 Rider Television Manual. If ordering the Manual ($18.00) you automatically get this book.

Even if television is not yet in your area it will be soon. You need to know about it *now*.

Over 200 pages Illustrated . . . $2.70

FM TRANSMISSION & RECEPTION

by John F. Rider and Seymour D. Uslan

Included among the "100 Best Technical Books of 1947 and early 1948" by the "Library Journal" this book has been adopted with equal enthusiasm by schools, colleges, engineers and radio servicemen.

Latest in theory, method of operation, high and low power, antennas, methods of alignment, solutions of servicing problems—everything needed.

416 Pages Cloth Cover, $3.60

UNDERSTANDING VECTORS AND PHASE

Provides easy understanding of vectorial presentations so you will get more benefit from radio articles and books.

160 Pages Cloth bound $1.89
Paper bound 99c

BROADCAST OPERATORS' HANDBOOK

by H. E. Enns, Station Engineer, WIRE

Tells how to operate a radio station and keep it in operation. Covers transmitter operation and maintenance, what to do and how to operate control room, master and remote controls.

288 Pgs.—Profusely Illus.—$3.30

OTHER RIDER BOOKS

Inside Vacuum Tube	424 Pgs.	$4.50
Servicing by Signal Tracing	360 Pgs.	4.00
Cathode Ray Tube at Work	338 Pgs.	4.00

Send for Complete Catalog of titles

BY THE PUBLISHER OF RIDER MANUALS

JOHN F. RIDER Publisher, Inc.
404 FOURTH AVENUE, NEW YORK 16, N.Y.
Export: Rocke-International Corp.
13 E. 40th Street, New York 16, N.Y.

USEFUL HANDY SANDING INFORMATION FOR INSTRUCTORS

GET THIS ABRASIVE SELECTOR

Slide rule type abrasive selector gives valuable data on types and use of coated abrasives, lubricants and rubbing and polishing agents. Excellent for all types of sanding and finishing. Only 40c—send in stamps or coin.

Enclosed with abrasive selector is a folder completely describing the Sterling Portable Electric Sander — an amazingly versatile tool for fast, economical finishing operations on wood and metal.

STERLING TOOL PRODUCTS CO.
1336-P Milwaukee Avenue Chicago 22, Ill.

STERLING MODEL 1000 SANDER } PORTABLE ELECTRIC

FOR MAINTENANCE, PRODUCTION, REFINISHING, REPAIR

BOICE-CRANE
NO. 1420 SIX-INCH JOINTER

Tables on the Boice-Crane are 5" longer than most others, for the accurate jointing of 25% to 50% longer stock, and the fence is 33" long (10" longer than most others). The ONLY fence that is 100% rigid, permits steady guiding and accurate cuts through the full length of even heavy 12-foot doors and sash. Unskilled operators get perfect results and more output because they can give entire attention to feeding the stock.

The only 6-inch jointer with quick acting fence locks at both ends. Even six times ordinary feed pressure cannot spring fence sidewise nor up on right angle or bevel cuts.

The 2¾" diameter cutterhead has a 3" diameter cutting arc, the largest in any low-priced 6-inch jointer, for freer cutting "rake-angle" to knives, for a chatterless and much smoother shearing cut rather than the chipping and chattering cut common to smaller diameter cutterheads. Cutterhead and bearings will withstand speeds up to 5500 r.p.m.

Features a double-pivoted cutterhead guard, which when rabbeting, is not bodily removed from the machine (usually the case) but swings down and out of the way, remaining immediately replaceable when conventional jointing is resumed, thus reducing the chances of failing to return guard to position.

Dual fence controls BOTH at operators fingertips.

Floor cabinet has motor compartment and dust chute.

4 models, belt or direct motor drive, bench or floor type.

SPECIFICATIONS

Overall length: 43½". Tables: 6" wide x 36" long. Max. width of cut: 6". Fence: 33" long x 3⅜" high. Depth of cut, max.: 9/16". Cutterhead: 2¾" dia. 3 knives.

BOICE-CRANE POWER TOOLS

- Designed for ready adaptability to a wide range of projects, fewer machines are needed to fill all your requirements.
- As nearly 100% safe as modern devices permit.
- Of just the right size for school shops, they permit more efficient layouts than larger equipment.
- Durably constructed, they can take a beating which would incapacitate most machines.

WRITE FOR FREE LITERATURE

Boice-Crane Power Tools can be seen in Booths #25 and 26 at the AVA Convention at Milwaukee, December 1-2-3.

BOICE-CRANE COMPANY
932 CENTRAL AVENUE, TOLEDO 6, OHIO
Drill Presses • Jig Saws • Lathes • Jointers • Belt Sanders • Spindle Sanders
Spindle Shapers • Band Saws • Saw Jointers • Thickness Planers

(Continued from page 22A)

mentals, ignition systems, fuels and fuel systems, carburetors, superchargers, lubricants and lubricating systems, propellers, controlled pitch propellers, engine installations, cooling systems, starter systems, engine theory and operation, and jet propulsion.

Basic Repair Operations — Automotive

Cloth, hard bound, 220 pp., 7¾ by 10¼ in., illus., $3.25; plastic bound, paper covered, $2.50. Delmar Publishers, Inc., Albany 1, N. Y.

Attention is focused in this book on the related technical information and repair operations which are basic in training automobile mechanics.

The series of instructional units starts with the auto mechanic and his duties and responsibilities. A partial list of topics covered includes shop organization and management, preparing a car for service, customer satisfaction and principles of analyzing repair jobs.

The actual repair operations deal with the use of jacks and hoists; installing fastening and locking devices; servicing tubing and fittings; replacing gaskets, belts, and hose; use of pullers; removing and installing front and rear wheel assemblies, oil and grease seals; replacing expansion plugs, and others.

Industrial Arts Design

By William H. Varnum. Cloth, 248 pp., 7⅜ by 9⅞ in., illus. The Manual Arts Press, Peoria, Ill.

A book on design which has been the inspiration of industrial-arts teachers for years.

It shows how in their industrial-arts designs, the primary mass can be effectively divided, how contour and surface enrichment can be applied, and how color can be used artistically.

The book also shows how the rules of design may be applied in sheet-metal and pottery work. Besides this there are many examples shown throughout the book on how they may be applied in cabinetmaking, turning, and jewelry making.

Metalwork

By Donald Smith. Cloth, 64 pp., 5½ by 8½ in., illus., $2.25. B. T. Batsford, Ltd., New York 22, N. Y.

An interesting historical presentation which the author has combined with suggestions for making practical things for present use which exemplify the work done by the artisans of the past.

Most-Often-Needed 1948 Television Servicing Information

Compiled by M. N. Beitman. Paper cover, 144 pp., 8⅜ by 10¾ in., illus., $3. Supreme Publications, Chicago, Ill.

This is a very helpful book containing a wealth of factory data.

Technical Drawing Problems Series 2

By Henry C. Spencer and Hiram E. Grant. Paper cover, spiral binding, 9½ by 11 in., $4.25. The Macmillan Co., New York, N. Y.

A workbook containing a comprehensive series of problem sheets presenting a wide variety of technical drawing problems taken from industry and practical situations.

Lettering practice, freehand sketching, completion problems, making of inked tracings are all included. There also are testing sheets.

Design of Machine Elements

By M. F. Spotts. Cloth, 402 pp., 6¼ by 9¼ in., illus., $5. Prentice-Hall, Inc., 70 Fifth Ave., New York City.

A college text on machine design which will be found valuable also by men engaged in actually designing machinery in industrial drafting rooms.

The 14 chapters clearly present the subject under the following titles: Fundamental principles; Stresses; Torsion; Springs; Belts, brakes, and clutches; Welded and riveted joints; Lubrication; Ball and roller bearings; Spur gears; Helical, bevel, and worm gears; Miscellaneous machine elements; and Engineering materials.

The book contains numerous tables of many kinds, and also many examples showing how to solve problems that arise in the design of machinery.

Machines for the Farm, Ranch, and Plantation

By Arthur W. Turner and E. J. Johnson. Cloth, 793 pp., 6⅜ by 9¼ in., illus., $4.80. McGraw-Hill Book Co., New York, N. Y.

A book on machines for producing and partially processing the farm crops common to the United States and Canada.

It gives directions for the selection, operating, servicing, reconditioning, and storing of machinery used for seedbed preparation, crop-planting, crop tillage, harvesting and harvest handling, transporting, and transmission of power.

The book is well and profusely illustrated, and the descriptive matter is clearly and concisely written.

Swoope's Lessons in Practical Electricity

By Erich Hausmann. Cloth, 769 pp., 6¼ by 9¼ in., illus., $4.80. D. Van Nostrand Co. Inc., New York, N. Y.

This is the eighteenth edition of this text. It has been thoroughly revised and brought up to date. The newer terms and symbols have been introduced, as well as the later developments in radio, electronics, radar, and television.

The subject matter has also been rearranged. The book contains directions for 115 experiments, 175 worked-out problems, and there are upwards of 600 questions and 300 problems.

Triangulation Short-Cut Layouts

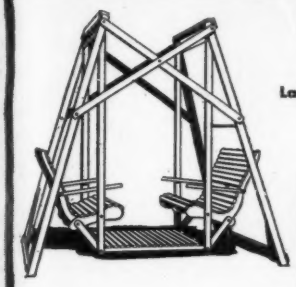
By Joseph J. Kaberlein. Cloth, 6¾ by 10⅛ in., illus., $5. The Bruce Publishing Co., 540 No. Milwaukee St., Milwaukee, Wis.

A fitting companion book for the two preceding sheet-metal layout books written by this author.

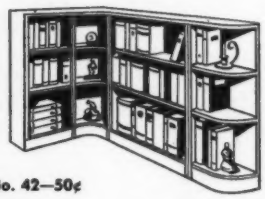
As in his former books the explanations are simple and concise, making it easy to follow the layout steps shown in the illustrations.

The book contains 151 plates, most of which present fully laid out problems to which triangulation must of necessity be applied.

The book also contains some tables that will be useful to the student, apprentice, or journeyman sheet-metal worker.



Lawn Glider, No. 155—50¢



Bookcase, No. 42—50¢

EASI-BILD* Full-Size Patterns attack "fear complex"!

Now you can eliminate the "fear complex" most students get when they tackle their first project.

These new *full-size* patterns build self-confidence by making project-building easy—simply trace pattern on wood; saw and assemble. And the completion of the first project makes the boys want to build others. Almost 100 projects available.

Every Easi-Bild Pattern contains a complete list of needed materials and assembly illustrations—shows where each nail, screw or bolt is used, tells which one of these CASCO glues to use for the job.

Cascamite for indoor projects—furniture, toys, cabinets.

Cascophen for outdoor projects—boats, sports equipment.

Cascorez for models, paper projects or where "fast set" is important.

See for yourself. Send coupon below for either or both of the 2 popular patterns shown above . . . also description of complete pattern service and Casco Gluing Chart. See how Easi-Bild simplifies woodworking.

CASCO Pattern Dept. IV-118, P. O. Box 215, Pleasantville, N. Y.
Enclosed is_____for patterns checked below.
☐ Lawn Glider, No. 155—50¢ . . . ☐ Bookcase, No. 42—50¢

Name_____Title_____
School_____
Address_____
City_____Zone_____State_____

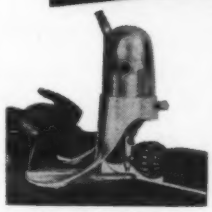
THE BORDEN COMPANY • CHEMICAL DIVISION
Makers of Casco Glues

*Reg. U. S. Pat. Off. by Easi-Bild Pattern Co.

RS4A

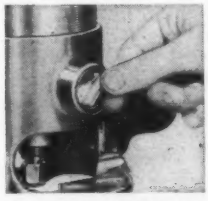
Stanley-Carter Router with micrometer motor casing for safe . . . accurate . . . fast depth adjustment

Do your shop facilities give your students the "KNOW-HOW" TO MAKE GOOD IN INDUSTRY?



Beading and Fluting — difficult-looking cuts made simply, easily. Needs only attachment, arbor and guide.

Dovetail Attachment — for cutting perfect matching corner dovetails . . . fast.



THIS LITTLE KNOB lets you raise or lower motor and bit, or remove the motor entirely. Combines precision and speed.

IF your shop budget is tight, can you provide the facilities needed to give your students the experience required by industry?

The answer is . . . "Yes" . . . IF you plan your purchases wisely . . . if you make sure that every tool you buy is of the best possible quality and designed for maximum utility. This Stanley-Carter RS4A Router-Shaper is ideal foundation equipment. It performs hundreds of operations just as they are performed throughout industry. Add a bit . . . add an attachment. Each time you have an additional, valuable tool.

Whatever your budget, why not work out a systematic plan so that year after year your purchases will broaden your shop facilities and broaden the "know-how" you can give your students? Select a Stanley-Carter Router — the one with the threaded motor casing which permits accurate depth adjustments by turning motor in the casing. Write for literature. Stanley Electric Tools, Stanley-Carter Sales Dept., 536 Myrtle St., New Britain, Conn.

STANLEY
Reg. U.S. Pat. Off.

HARDWARE · HAND TOOLS · ELECTRIC TOOLS

Shop Equipment News

NEW PRODUCTS — PUBLICATIONS

STANLEY PLAN PACKETS OF EARLY AMERICAN DESIGNS

The educational department of Stanley Tools, New Britain, Conn., has recently announced a new series of plan sheets for woodworking shops. Many of the plans have been adapted from museum pieces, and all reflect the influence of Early American design. All the plans are suitable for junior high shop classes.

The working drawings have been made by William Klenke and conform in style to other Stanley plans already available. Each design is printed on a separate 8½ by 11-in. sheet, with photograph illustration of the finished item. The sheets are punched to fit into loose-leaf binders.

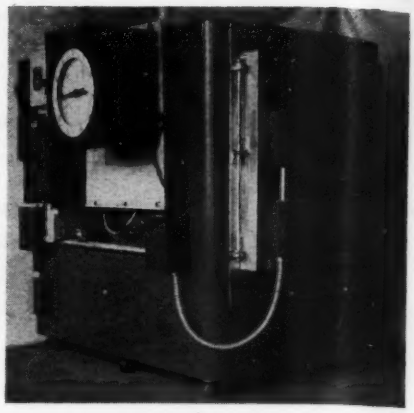
Two packets of the Early American Designs are available — Series A and Series B. Each packet contains 15 different designs and is offered at 25 cents per packet, postpaid.

For brief reference use IAVE—1101.

Stanley packets of early American design

AN ADAPTABLE POTTERY KILN FOR SCHOOLS

The illustration shown herewith presents an 18 by 24 by 48-in. electric kiln, equipped with an electronic type of recording, indicating, and controlling instrument. This kiln was developed by James W. Weldon, manufacturer of electric, gas, and oil furnaces, kilns, and ovens for industrial and laboratory use, 2315 Harrison St., Kansas City 8, Mo.



Floor model with electronic indicating, recording, controlling instrument

The heating elements are of the ribbon type, designed for long life, and can be successfully used for many hours of firing.

The kiln shown is typical of the larger type pottery kilns now used in high schools and colleges. It has a 2-in. air space between the hearth and the subhearth in order to remove the hot spot which results when work is placed directly over the bottom heating units.

The heating elements are supported by carriers and not placed in grooves cut in the insulating

(Continued on page 28A)

McGRAW-HILL

New and Timely Vocational Books

Mechanical Drawing—New Fifth Edition — *French and Svensen*
A complete revision. New chapters on aircraft drawing, production illustration, and welding drawing. Many new illustrations and problems. New Text-Films. $2.80

Carpentry for the Building Trades — *Lair*
Gives students quick working knowledge of building carpentry, emphasizing tools and methods. $2.40

Automotive Mechanics — *Crouse*
A new, simpler approach, covering operation, construction, maintenance and repair, and trouble-shooting. Hundreds of illustrations. $3.00

Working With Plastics — *Dunham*
Basic work in phenolic and acrylic plastics, general information, and a wide variety of projects. Specific how-to-do-it instructions. $3.50

Elements of Radio Servicing — *Marcus and Levy*
Makes all phases and problems of modern radio servicing clear and and understandable. Stage-by-stage approach. Stress on servicing procedures. $3.60

Workbook in Mechanical Drawing — *Coover*
Projects and problems of everyday interest and usefulness geared to the actual needs of beginners. $1.48

Send for copies on approval

McGRAW-HILL BOOK CO., INC.
330 West 42nd St. New York 18, N. Y.

SOLVE YOUR Plastic Supplies PROBLEMS IN ONE MOVE!

CALL ON PLASTIC PARTS AND SALES' QUICK SERVICE AND HUGE STOCK

PARTIAL LIST OF PLASTICS IN STOCK
- PLEXIGLAS
- LUCITE
- CELLULOSE ACETATE
- CASTOLITE
- METAL FINDINGS
- PLASTIC JEWELS
- HANDBOOKS
- DYES—ADHESIVES
- BUFFS — FINISHING COMPOUNDS
- POWER TOOLS
- MANY OTHER ITEMS

SEND FOR FREE PRICE LIST!

Instructors: It's bigger and better than ever. Write on school letterhead.

OVER 1700 ITEMS OFFERED FOR ALL PLASTIC CRAFT PROJECTS

Here is a partial list of our huge stock of plastics, adhesives, dyes, and other items available for immediate shipment! All sizes and colors of nationally known brands of sheets, rods, and tubes places at your disposal one of the largest stocks of plastics on the market. *And our mid-continent location enables us to conveniently ship to any part of the country,* and most orders are shipped same day received.

WRITE FOR PRICE LIST AND CATALOG! INSTRUCTORS: Accept *FREE* our big plastics price list, folder on Internal Carving of Plastics, Jewelry Findings Catalog, Information on Fabrication of Plastics — your buying guides for all plastic craft projects. Write on school letterhead stating position. STUDENTS must send 25c for this literature which will be deducted from first order.

PLASTIC PARTS & SALES Dept. S-2118
1157 S. Kingshighway Blvd. St. Louis 10, Mo.

There is no substitute for Quality

• For best classroom results, make sure the Drafting Supplies and Artist Materials you use bear the well-known WEBER Trade-mark . . .

WEBER

Trade Mark Reg. U. S. Patent Off.

ARTIST and DRAWING MATERIALS

Cat. Vol. 700 to Teachers and Schools on request

F. WEBER CO.

Est. 1853
PHILADELPHIA 23, PA.
ST. LOUIS 1, MO. • BALTIMORE 1, MD.

Patronize Your Nearest Weber Dealer

MECHANICAL DRAWING SUPPLIES

Drawing Instruments
T-Squares
Triangles
Curves
Scales
Slide Rules
Protractors
Drawing Boards
Drawing Tables

ART AND COMMERCIAL ART MATERIALS

Tempera
Show Card Colors
Malfa Oil and Water Colors

Brushes

Linol Block Printing Inks and Materials

Waterproof Drawing Inks

School and Drafting Room Furniture

PLASTICS MADE PRACTICAL

By Chris H. Groneman

• More than 100 suggestions with photographs, drawings, building material, and procedures for making attractive articles out of plastics. Sufficiently elementary to assure the beginner satisfactory results. The most recent and most complete text and project book on this new creative handcraft. *$4.50*

« WRITE FOR A COPY ON 5 DAYS' APPROVAL »

THE BRUCE PUBLISHING COMPANY
711 Montgomery Bldg., Milwaukee 1, Wisconsin

3 EXCLUSIVE FEATURES

give you better value in Millers Falls Planes

The outstanding performance you get with a Millers Falls plane is largely due to these three exclusive construction features. But don't overlook other important features of these quality planes . . . reinforced seasoned bottoms, rigidly seated frogs, self-aligning lever cap tips, comfortable hardwood knobs and handles, sensitive side and depth adjustment of cutters. Ask your supplier about the complete line — including smooth planes, jack planes, fore planes, jointer planes and block planes.

MILLERS FALLS TOOLS SINCE 1868

MILLERS FALLS COMPANY
GREENFIELD, MASSACHUSETTS

Just off press

INDUSTRIAL ARTS IN GENERAL EDUCATION

by Gordon O. Wilber
State Teachers' College, Oswego, New York

- *Newer Concepts of Industrial Arts as Exemplified in the General Shop*
- *Relationship in Industrial Arts to General Education Clearly Shown*
- *Based on a Modern Concept of General Education*

CONTENTS

I The Purposes of General Education
II The Relationship of Industrial Arts to General Education
III Objectives of Industrial Arts
IV Analysis of Objectives
V Selection of Subject Matter for Industrial Arts
VI Selection of Subject Matter for Industrial Arts (continued)
VII Starting the Class
VIII The Demonstration
IX Visual Aids in Industrial Arts
X The Industrial Arts Project
XI Written Instructional Materials
XII The Shop Library and Planning Centers
XIII Personnel Organization
XIV Industrial Arts and Public Relations
XV Community Resources
XVI Records and Record Keeping
XVII Shop Planning and Layouts
XVIII School Shop Equipment
XIX Evaluating Results in Industrial Arts

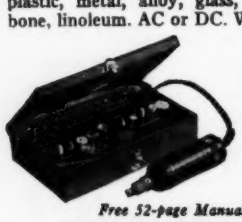
You are cordially invited to take advantage of our 20% introductory discount

INTERNATIONAL TEXTBOOK COMPANY

Department 211, Scranton 9, Pennsylvania
One of the World's Great Educational Publishers

THE FIRST TOOL OF THIS KIND — TODAY'S FINEST

Start a project for pleasure or profit. Make ship, plane and train models, delicate, internally carved costume jewelry, wooden statuettes, bookends, etc. Handee is the ideal tool for hobbyist, repairman, mechanic — novice or expert. It gives you smooth, steady power right at your fingertips, responds easily to your direction. Handee works on wood, plastic, metal, alloy, glass, leather, horn, stone, bone, linoleum. AC or DC. Wt. 12 oz. 25,000 r.p.m.



HANDEE KIT

A strong steel carrying case holds the Handee and 40 most popular accessories. Complete. $27.50. Handee only, with 7 accessories, $20.50. Get it at stores everywhere. If they can't supply you we'll send it postpaid.

Free 52-page Manual on request.

CHICAGO WHEEL & MFG. CO.

1101 Monroe St. Dept. IA Chicago 7, Ill

STERLING STEEL FLASKS

Assure Easy Handling

Sterling all-steel, all-welded foundry flasks combine maximum strength with minimum weight. Solid center rib and solid sand flanges at top and bottom. Full-width bearing. In style "S" flask, pin lugs and handles are combined. When closing flask, molder can guide cope over pins by feeling pins with his fingers. In many foundries, style "S" flask has replaced snap flasks. Prevents run-outs. Requires less sand.

Write for new Catalog No. 59, describing the complete line of Sterling Foundry Equipment.

Sterling FOUNDRY FLASKS

STERLING WHEELBARROW COMPANY · MILWAUKEE 14, WIS., U.S.A.

(Continued from page 26A)

brickwork. They, as well as the supports, can be replaced easily.

This kiln will fire large heads, statuary, or many small pieces. As many as 250 handle holders are fired in this kiln at one firing.

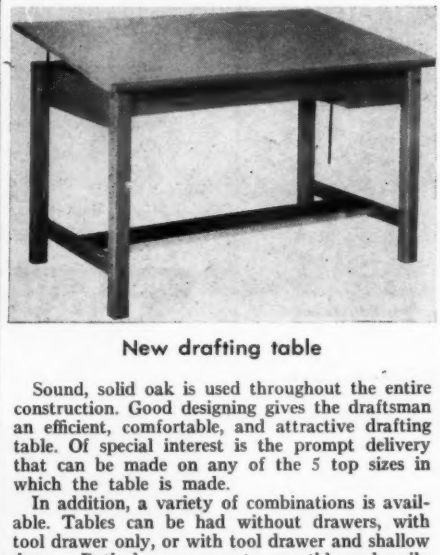
For further information address the manufacturer.

For brief reference use IAVE—1102.

NEW DRAFTING TABLE

The Engineering Manufacturing Company of Sheboygan, Wis., announces the addition of the 7700 series of 4 Post Drafting Tables to its well-known line of drafting room furniture and equipment.

Two outstanding features distinguish this table from others in the field. It is equipped with a moisture sealed, 5-ply basswood, SECO drawing top. The second feature is the wide, comfortable, linoleum covered footrest. Research among draftsmen prompted the inclusion of this fatigue resisting feature.



New drafting table

Sound, solid oak is used throughout the entire construction. Good designing gives the draftsman an efficient, comfortable, and attractive drafting table. Of special interest is the prompt delivery that can be made on any of the 5 top sizes in which the table is made.

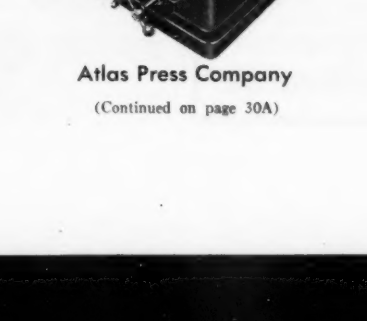
In addition, a variety of combinations is available. Tables can be had without drawers, with tool drawer only, or with tool drawer and shallow drawer. Both drawers operate smoothly and easily on metal runs. For those who require additional drawer space there is an auxiliary unit with a supply drawer and a file drawer. This auxiliary unit is also constructed of oak and is so designed as to provide for easy attachment to the table proper.

The standard line of tables is finished in a rich golden oak, with an alternate choice of attractive light oak.

For brief reference use IAVE—1103.

NEW ATLAS BALL BEARING SPINDLE SHAPER

The new low cost Atlas spindle shaper is a big-capacity portable machine, built for accuracy and



Atlas Press Company

(Continued on page 30A)

PROMPT SHIPMENTS
from a
COMPLETE STOCK of
LARSON LEATHER

For everything in leather when you need it — consult Larson Leathercraft Headquarters. Wide line to choose from. Moderate priced tooling leathers as well as top quality calfskins.

We supply all tools, materials and instructions for making:

- *GLOVES*
- *LINK BELTS*
- *PYROSTRIPS*
- *MOCCASINS*
- *BILLFOLDS*
- *WOOLSKIN TOYS and MITTENS*
- *COIN PURSES*
- *COMB CASES*
- *KEY CASES*

MANY OTHER USEFUL ITEMS

Send for FREE catalog

J. C. LARSON COMPANY

Dept. K — 820 S. Tripp Avenue Chicago 24, Ill.

WANT GOOD SERVICE?

When in a rush, send your order to us. 27 years of good materials.

OUR NEW CATALOGUE NOW READY

INDIANHEAD ARCHERY MFG. CO.

BOX 303-BP LIMA, OHIO

Extra prompt service

Electro-Typers

Especially qualified to be of service to the school printshop.

Promptness and quality assured.

Forms returned same day received.

Badger - American Electrotype Co.

600 Montgomery Bldg.

407 East Michigan St., Milwaukee, Wis.

ELECTRIC KILNS

LONG LIFE RIBBON TYPE HEATING ELEMENTS

2000 F° to 2200 F° — Quick Delivery

Large & Small — Bench & Floor Models

JAMES W. WELDON
Laboratory

2315 Harrison St. Kansas City 8, Mo.

LUMBER FOR SCHOOLS

T. A. FOLEY LUMBER CO.

PARIS, ILL.

SEEKING A POSITION?

The demand for teachers of Industrial Arts and Vocational subjects offers unusual opportunities to beginning teachers and to experienced men and women who are seeking advancement. Many vacancies listed, East and South. Write, telling us about yourself.

THE BALTIMORE TEACHERS AGENCY
William K. Yocum, *Manager*

516 N. Charles Street Baltimore, Md.